

TITLE 4. PROFESSIONS AND OCCUPATIONS

CHAPTER 48. ARIZONA UNIFORM PLUMBING CODE COMMISSION

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ARTICLE 1. ARIZONA UNIFORM PLUMBING CODE

R4-48-101. Chapter 2, Definitions

- A.** The following definition applies in this Article: "Person" has the meaning set forth in A.R.S. § 1-215.
- B.** The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:
 - 1. Sec. 202.0 Add a definition for "Air Admittance Valve" which reads:
Air Admittance Valve means a one-way valve designed to allow air to enter the plumbing drainage system when negative pressure develops in the piping system.
 - 2. Sec. 202.0. Modify the definition of "Insanitary" by replacing numbered paragraphs (2) and (3) with the following:
 - (2) Any opening in a drainage system, except where lawful, which is not provided with an approved liquid sealed trap.
 - (3) Any plumbing fixture or other waste discharging receptacle or device, which is not supplied with water sufficient to flush it and maintain it in a clean condition except those specifically designed to function without water.
 - 3. Sec. 202.0. Add a definition for "PEX" which reads: "PEX means Cross-linked Polyethylene."
 - 4. Sec. 202.0 Add the following definition:
PE-AL-PE – Polyethylene-Aluminum-Polyethylene
 - 5. Sec. 202.0 Add the following definition:

PEX-AL-PEX – Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene

Historical Note

New Section adopted by final rulemaking at 5 A.A.R. 802, effective February 24, 1999 (Supp. 99-1). Amended by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-102. Incorporation of the Uniform Plumbing Code by Reference

A. All persons shall comply with the International Association of Plumbing and Mechanical Officials' (I.A.P.M.O.) Uniform Plumbing Code (1994 Edition) which is incorporated by reference, including appendices A through J, and installation standards, as the state plumbing code. This incorporation by reference does not include any later amendments or editions. Copies of the incorporated material are available from I.A.P.M.O., 20001 Walnut Drive South, Walnut, CA, 91789-2825 and are on file with Arizona Uniform Plumbing Code Commission and the Office of the Secretary of State.

B. The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

Delete pages: one through 14, after making all modifications in this Article.

Historical Note

New Section adopted by final rulemaking at 5 A.A.R. 802, effective February 24, 1999 (Supp. 99-1). Amended by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

Table A. Repealed

Historical Note

New Table A adopted by final rulemaking at 5 A.A.R. 802, effective February 24, 1999 (Supp. 99-1). Table A repealed by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

Table B. Repealed

Historical Note

New Table B adopted by final rulemaking at 5 A.A.R. 802, effective February 24, 1999 (Supp. 99-1). Table B repealed by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

Illustration A. Repealed

Historical Note

New Illustration A adopted by final rulemaking at 5 A.A.R. 802, effective February 24, 1999 (Supp. 99-1). Illustration A repealed by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-103. Chapter 3, General Provisions

A. The rules of this Article are adopted under A.R.S. § 41-619, which provides for the adoption statewide of the Uniform Plumbing Code ("Code"). The rules do not specify the procedures by which the Code will be enforced, which may be governed by other provisions of state law. The rules do not supersede, restrict, or negate the authority of any state agency, municipality, or county to administer, delegate, or enforce laws, statutes, rules, or ordinances within its respective jurisdiction.

B. The Uniform Plumbing Code incorporated in R4-48-102(A), is modified as follows:

1. Move Sec. 101.4.1.3 to a new Sec. 301.1.5.
2. Move Sec. 101.5.2 to a new Sec. 301.1.6.
3. Move Sec. 101.5.4 to a new Sec. 301.1.7.
4. Move Sec. 101.5.5 to a new Sec. 301.1.8.
5. Move Sec. 103.5 to a new Sec. 318.0.
6. Move Sec. 103.5.1 to a new Sec. 318.1.
7. Move Sec. 103.5.1.2 to a new Sec. 318.2.
8. Move Sec. 103.5.1.3 to a new Sec. 318.3.
9. Move Sec. 103.5.1.4 to a new Sec. 318.4.
10. Move Sec. 103.5.5 to a new Sec. 318.5.
11. Move Sec. 103.5.5.1 to a new Sec. 318.6.
12. Move Sec. 103.5.5.2 to a new Sec. 318.7.
13. Move Sec. 103.5.3 to a new Sec. 319.0.
14. Move Sec. 103.5.3.1 to a new Sec. 319.1.
15. Move Sec. 103.5.3.2 to a new Sec. 319.2.
16. Move Sec. 103.5.3.4 to a new Sec. 319.3.
17. Move Sec. 103.5.3.5 to a new Sec. 319.4.
18. Move Sec. 103.5.3.7 to a new Sec. 319.5.
19. Move Sec. 103.5.6.1 to a new Sec. 319.6.
20. Move Sec. 103.5.6.2 to a new Sec. 319.7.
21. Move Sec. 103.5.6.3 to a new Sec. 319.8.
22. Move Sec. 712.4 to a new Sec. 320.0.
23. Move Sec. 712.4.1 to a new Sec. 320.1.
24. Move Sec. 712.4.2 to a new Sec. 320.2.
25. Move Sec. 712.4.3 to a new Sec. 320.3.
26. Move Sec. 712.4.4 to a new Sec. 320.4.
27. Move Sec. 103.6 to a new Sec. 321.0.
28. Move Sec. 103.6.1 to a new Sec. 321.1.
29. Move Sec. 103.6.2 to a new Sec. 321.2.
30. Move Sec. 103.6.3 to a new Sec. 321.3.
31. Add three new rows to Table 3-1. Refer to Table A – Materials and Types of Joints (Horizontal and Vertical).
32. Sec. 316.1.5 is modified to read:

Solvent Cement Plastic Pipe Joints. Plastic pipe and fittings designed to be joined by solvent cementing shall comply with appropriate IAPMO Installation Standards.

ABS pipe and fittings shall be cleaned and then joined with listed solvent cement(s).

CPVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cement(s).

Exception: Listed solvent cements that do not require the use of a primer shall be permitted for use with CPVC pipe and fittings 1/2" through 2" in diameter, manufactured in accordance with ASTM D 2846/D 2846M-99, which is incorporated by reference and published by American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. This incorporation by reference does not include any later amendments or editions.

PVC pipe and fittings shall be cleaned and joined with listed primer(s) and solvent cement(s) conforming to ASTM F 493-97, which is incorporated by reference and published by American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959. This incorporation by reference does not include any later amendments or editions.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

Table A. Materials and Types of Joints (Horizontal and Vertical)

Materials	Type of Joints	Horizontal	Vertical
PEX	Mechanical	One inch (25.4mm) and smaller, Three feet (0.9 m), 1-1/4 inch (31.8mm) and larger four feet (1.2 m).	Base and each floor. Provide mid-story guides.
PE-AL-PE	Mechanical	One inch (25.4 mm) and smaller, 98 inches (2489 mm)	Base and each floor. Provide mid-story guide.
PEX-AL-PEX	Mechanical	One inch (25.4 mm) and smaller, 98 inches (2489 mm)	Base and each floor. Provide mid-story guide.

Historical Note

New Table made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). New Table A made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-104. Chapter 4, Plumbing Fixtures

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 402.1 is modified to read: "The maximum flow rates and quantities for all plumbing fixtures and fixture fittings shall be consistent with A.R.S. Title 45, Chapter 1, Article 12."
2. Sec. 402.2 is deleted.

Historical Note

New Section adopted by final rulemaking at 5 A.A.R. 4309, effective October 18, 1999 (Supp. 99-4). Section repealed; new Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

Table A. Repealed

Historical Note

Table A adopted by final rulemaking at 5 A.A.R. 4309, effective October 18, 1999 (Supp. 99-4). Table A repealed by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

Table B. Repealed

Historical Note

Table B adopted by final rulemaking at 5 A.A.R. 4309, effective October 18, 1999 (Supp. 99-4). Table B repealed by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-105. Chapter 5, Water Heaters

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 501.0 is modified to read: "General. The regulations of this chapter shall govern the construction, location, and installation of all fuel-burning and other water heaters heating potable water, together with all chimneys, vents, and their connectors. All design, construction, and workmanship shall be in conformity with accepted engineering practices and shall be of such character as to secure the results sought to be obtained by this Code. No water heater shall be hereinafter installed which does not com-

ply in all respects with the type and model of each size thereof approved by the Administrative Authority. A list of generally accepted gas equipment standards is included in Table 14-1. A water heater (boiler) which exceeds any of the following limitations shall not be placed in service until the vessel is separately inspected pursuant to A.R.S. Title 23, Chapter 2, Article 11.

- (a) 120-gallon (454.2L) nominal water capacity.
 - (b) 160 PSI (1,103.2 kPa) operating pressure.
 - (c) 210° F (98.9° C) operating temperature.
 - (d) 200,000 btu/h (58,620W) heat input.
2. Sec. 507.2 is modified to read: "In new construction, all enclosed buildings shall be provided with combustion air obtained from outside. In existing buildings of ordinary tightness insofar as infiltration is concerned, all or a portion of the combustion air for fuel-burning water heaters may be obtained from infiltration if the enclosure volume equals at least 50 cubic feet per 1000 btu/h (4.831L/W) input of the water heater. Existing buildings of unusually tight construction shall also be provided with outside combustion air. No change in combustion air is required when an existing fuel-burning water heater is replaced with a new water heater having the same or smaller btu/h input capacity. When an existing fuel-burning water heater is replaced by a higher-capacity water heater, or when additional fuel burning water heaters are installed in an existing building containing other fuel-burning appliances, the room or space shall be provided with combustion air as required for new construction.
 3. Sec. 507.3.1. Add an exception to read: "Combustion air openings may be provided in an outside door provided:
 - (a) The door is not less than two feet in width and six feet eight inches in height; and
 - (b) The openings are spaced as far apart as possible or a full louvered door is provided; and
 - (c) The equipment room ceiling is not more than 16 inches above the top of the door.
 4. Sec. 507.6 is added to read: "Liquefied Petroleum Gas (LPG). All provisions of this chapter shall apply to combustion air for equipment using liquefied petroleum gas. Exceptions:
 - (a) The bottom of the lower combustion air opening shall be located at or below the floor of the room containing LPG-fueled equipment.
 - (b) The lower combustion air duct, when used, shall have the bottom installed level or with a downward slope, starting from a point at or below the equipment room floor and continuing to the outside of the structure. The duct shall terminate above the finish grade, and shall be provided with wire mesh screen to cover the opening.
 - (c) No pockets or trapped sections shall be permitted in any lower combustion air duct.
 5. Table 5-1 is modified. Refer to Table A - Size of Combustion Air Openings or Ducts for Gas - or Liquid-Burning Water Heaters.
 6. Sec. 517.6 is modified to read: "No venting system shall terminate less than three feet (0.9m) above any forced air inlet or evaporative cooler located within 10 feet (3.0m) or less than four feet (1.2m) from any property line except a public way.

Historical Note

New Section adopted by final rulemaking at 7 A.A.R. 1458, effective March 16, 2001 (Supp. 01-1). Section repealed; new Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

Table A. Size of Combustion Air Openings or Ducts for Gas- or Liquid-Burning Water Heaters

Column 1 Existing Buildings of Ordinary Tightness		Column 2 New Buildings and Unusually Tight Construction	
Condition	Size of Opening or Duct	Condition	Size of Opening or Duct
Appliance in unconfined ² space.	May rely on infiltration alone.	Appliance in unconfined ² space: Obtain combustion air from outdoors or from space freely communicating with outdoors.	Provide two openings, minimum 50 sq. in. each opening. ³
Appliance in confined ⁴ space 1. All air from inside building.	Provide two openings into enclosure each having 1 sq. in. (645mm ²) per 1000 btu/h input freely communicating with other unconfined interior spaces. ³ Minimum 100 sq. in. (0.06m ²) each opening.	Appliance in confined ⁴ space: Obtain combustion air from outdoors or from space freely communicating with outdoors.	Provide two openings into enclosure, minimum 50 sq. in. each opening. ³
2. All air from outdoors: Obtain from outdoors or from space freely communicating with outdoors.	Use the methods listed for confined space as indicated in Column 2.		

Notes¹For location of opening, see Section 507.3.²As defined in Chapter 2.³When the total btu/h input rating of all enclosed appliances/equipment exceeds 100,000 btu/h, the combined net free area of all combustion air openings shall be increased by not less than 1 additional square inch (645mm) for each 1000 btu/h in excess of 100,000 btu/h.⁴As defined in Section 202.0.**Historical Note**

New Table A made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-106. Chapter 6, Water Supply and Distribution

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 601.1. Add exception to read:
Potable running water is not required for waterless urinals that have been approved by the Administrative Authority.
2. Sec. 603.4 is added to read:
Secondary Backflow Protection. The following occupancies shall have Reduced Pressure Principle Backflow Prevention Assemblies installed as near as practical to the water service meter connection: Hospitals, surgical clinics, laboratories, morgues, mortuaries, veterinary hospitals, industrial occupancies, packing plants, slaughter houses, chemical plants, municipal waste treatment facilities, and construction water services. NOTE: Multiple water services which are interconnected onsite shall be provided with not less than a Double Check Valve Assembly at each service connection.
3. Sec. 604.1 is modified to read:
Water pipe and fittings shall be of brass, copper, cast iron, galvanized malleable iron, galvanized wrought iron, galvanized steel, or other approved materials. Asbestos-cement, CPVC, PE, PEX, PEX-AL-PEX, PE-AL-PE, or PVC water pipe manufactured to recognized standards may be used for cold water distribution systems outside a building, CPVC, PEX, or PEX-AL-PEX water pipe and tubing may be used for hot and cold water distribution systems within a building. PE-AL-PE water pipe may be used for cold water distribution systems within a building. All materials used in the water supply system, except

valves and similar devices shall be of a like material, except where otherwise approved by the Administrative Authority.

4. Sec. 604.11 is added to read:
Cross-linked polyethylene (PEX) tubing shall be marked with appropriate designation or designations consistent with the fitting system or systems for which the tubing has been listed or approved. PEX tubing shall be installed with mechanical joints in compliance with the appropriate standards and the manufacturer's instructions.
5. Sec. 604.12 is added to read:
Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX) and Polyethylene-Aluminum-Polyethylene (PE-AL-PE) composite piping shall be marked with appropriate designation or designations consistent with the fitting system or systems for which the piping has been listed or approved. PEX-AL-PEX and PE-AL-PE piping shall be installed with mechanical joints in compliance with the appropriate standards and the manufacturer's instructions.
6. Sec. 608.5 is modified to read:
All relief valves shall be provided with a drain, not smaller than the relief valve outlet, of galvanized steel, hard drawn copper piping and fittings, CPVC, PB, or listed relief valve drain tube with fittings which shall not reduce the internal bore of the pipe or tubing (straight lengths as opposed to coils) and shall extend from the valve to the outside of the building with the end of the pipe not more than two feet (0.61 m) nor less than six inches (152.4 mm) above the ground and pointing down-

ward. Such drains may terminate at other approved locations. No part of such drain pipe shall be trapped and the terminal end of the drain pipe shall not be threaded.

7. Move Sec. 103.5.1.1 to a new Sec. 610.15.
8. Move Sec. 103.5.3.3 to a new Sec. 610.16.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-107. Chapter 7, Sanitary Drainage

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Section 701.1.2 is deleted.
2. Sec. 707.4 is modified to read: Each horizontal drainage pipe shall be provided with a cleanout at its upper terminal and each run of piping, which is more than 100 feet (30.4 m) in total developed length, shall be provided with a cleanout for each 100 feet (30.4 m), or fraction thereof, in length of such piping. Exceptions:
 - (a) Cleanouts may be omitted on a horizontal drain line less than five feet (1.5 m) in length unless such line is serving sinks or urinals.
 - (b) Cleanouts may be omitted on any horizontal drainage pipe installed on a slope of 72 degrees or less from the vertical angle (angle of 1/5 bend).
 - (c) An approved type of two-way cleanout fitting, installed inside the building wall near the connection between the building drain and building sewer or installed outside of a building at the lower end of a building drain and extended to grade, may be substituted for an upper terminal cleanout.
3. Sec. 710.6, paragraph 1, is modified to read: Backwater valves, gate valves, motors, compressors, air tanks, and other mechanical devices required by this section shall be located where they will be accessible for inspection and repair at all times.
4. Delete Sections 712.4, 712.4.1, 712.4.2, 712.4.3, 712.4.4.
5. Sec. 713.4 is modified to read: The public sewer may be considered as not being available only when so determined by the Administrative Authority (local, county, or state).
6. Sec. 723.0 is modified to read: "Building sewers shall be tested by plugging the end of the building sewer at its points of connection with the public sewer or private sewage disposal system and completely filling the building sewer with water from the lowest to the highest point thereof or by approved equivalent low pressure air test, or by such other test as may be prescribed by the Administrative Authority. The building sewer shall be watertight at all points. Exception: Sewer tests may be waived at the discretion of the Administrative Authority.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-108. Chapter 8, Indirect and Special Wastes

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 807.4 is modified to read: The discharge pipe of a domestic dishwashing machine may be directly connected to the tailpiece of a sink drain, or into the waste "boss" of a food waste disposer without installation of an

airgap fitting. The dishwasher discharge line shall be securely fastened as high as possible, but not lower than two inches (50.8 mm) below the flood rim of the sink.

2. Sec. 807.5 is added to read: No dishwashing machine utilized for commercial purposes may be directly connected to a drainage system. Commercial dishwashers shall discharge into an approved receptor (floor sink) through an airgap of not less than one inch.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-109. Chapter 9, Vents

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 903.1.2 is deleted.
2. Sec. 909.0 is modified to read:
Special Venting
909.1 Air Admittance Valve

909.1.1 Vent systems utilizing air admittance valves shall comply with this section. Individual and branch-type air admittance valves shall conform to ASSE Standard 1051, which is incorporated by this reference and published by the American Society of Sanitary Engineering for Plumbing and Sanitary Research, 28901 Clemens Rd., Ste. 100, Westlake, OH 44145. This incorporation by reference does not include any later amendments or editions. This device shall close by gravity and seal the vent terminal at zero differential pressure (no flow condition) and under positive internal pressure. The air admittance valve provides a method of allowing air to enter the plumbing drainage system without the use of a vent extending to the open air and prevents sewer gases from escaping into the building.

909.1.2 The valves shall be installed in accordance with this section and the manufacturer's installation instructions. Air admittance valves shall be installed after the drain, waste, and vent testing required by Sections 712.2 or 712.3 has been approved by the administrative authority.

909.1.3 Individual and branch vents shall be permitted to terminate with a connection to the air admittance valve. The air admittance valve shall only be permitted to vent fixtures on the same floor, which connect to a building drain.

909.1.4 The air admittance valve shall be located at least 4" (102 mm) above the horizontal branch drain, or fixture drain being vented, within the maximum developed length permitted for the vent, and shall terminate at least 6" (152 mm) above insulation materials.

909.1.5 The air admittance valve shall be accessible for the purpose of maintenance or replacement. The valve shall be located within a space that allows air to enter the valve.

909.1.6 The air admittance valve shall be rated for the size of the vent to which it is connected.

909.1.7 Within each plumbing system utilizing air admittance valves, a minimum of one vent stack shall extend outdoors to the atmosphere.

909.1.8 Air admittance valves shall not be installed in special waste systems, as described in Chapter 8, nor in spaces used as supply or return air plenums.

909.2 Island Fixtures

Traps for island sinks and similar equipment shall be roughed in above the floor and may be vented by extending the vent as high as possible, but not less than the drainboard height and then returning it downward and connecting it to the horizontal sink drain immediately downstream from the vertical fixture drain. The return vent shall be connected to the horizontal drain through a wye-branch fitting and shall, in addition, be provided with a foot vent taken off the vertical fixture vent by means of a wye-branch immediately below the floor and extending to the nearest partition and then through the roof to the open air or may be connected to other vents at a point not less than 6" (152.4 mm) above the flood level rim of the fixtures served. Drainage fittings shall be used on all parts of the vent below the floor level and a minimum slope of 1/4" per foot (21 mm/m) back to the drain shall be maintained. The return bend used under the drainboard shall be a one piece fitting or an assembly of a 45°, a 90°, and a 45° elbow in the order named. Pipe sizing shall be as elsewhere required in this Code.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-110. Chapter 10, Traps

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 1005.0 is modified to read: Trap Seals. Each fixture trap shall have a liquid seal of not less than two inches (50.8mm) and not more than four inches (101.6mm) except where a deeper seal is found necessary by the Administrative Authority for special conditions. Traps shall be set true with respect to their liquid seals and, where necessary, they shall be protected from freezing.
2. Sec. 1007.0 is modified to read: Trap Seal Protection. Floor drain or similar traps directly connected to the drainage system and subject to infrequent use shall be provided with an approved means of maintaining their water seals, except where not deemed necessary for safety or sanitation by the Administrative Authority. When automatic trap priming devices are installed, they shall be accessible for maintenance.
3. Sec. 1007.1 is added to read: Approved Means of Maintaining Trap Seals. Approved means of maintaining trap

seals include the following, but are not limited to the methods cited:

- (a) Listed Trap Seal Primer.
- (b) A hose bibb or bibbs within the room.
- (c) Drainage from untrapped lavatories discharging to the tailpiece of those fixture traps which require priming. All fixtures shall be in the same room and on the same floor level as the trap primer.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-111. Chapter 11, Storm Drainage

This chapter has no modifications.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-112. Chapter 12, Fuel Piping

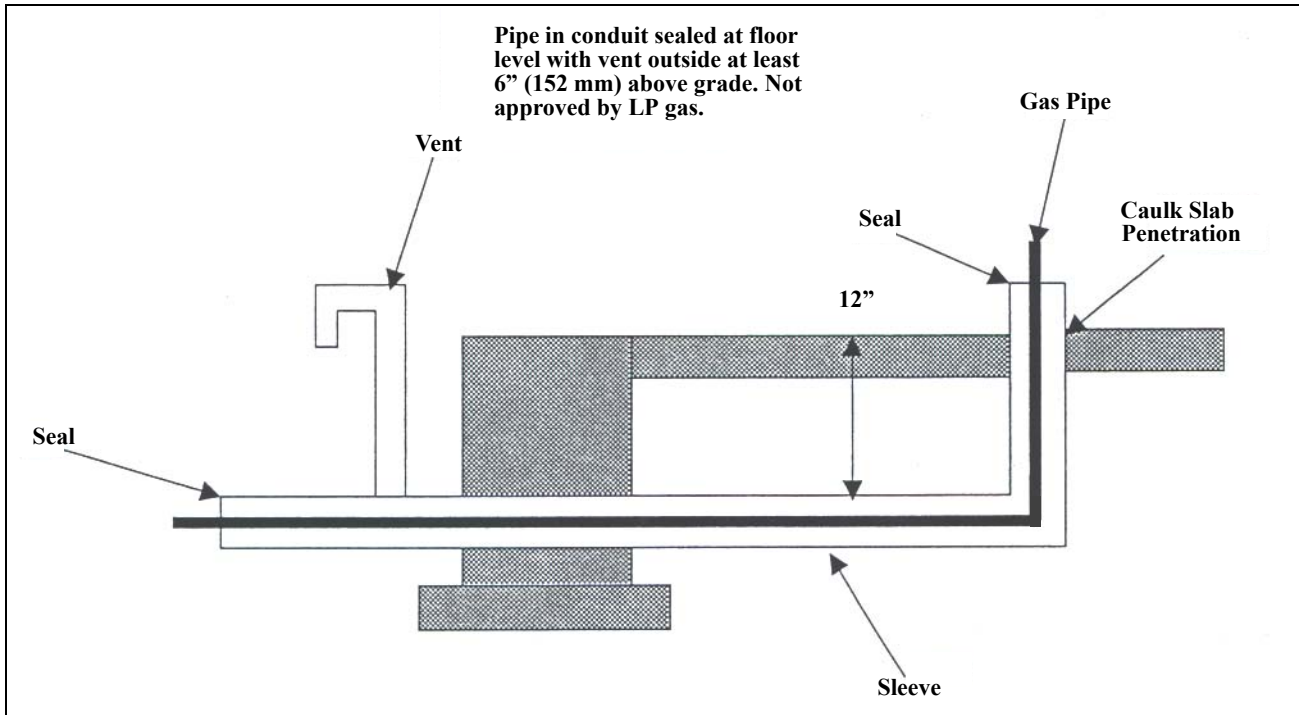
The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Sec. 1210.1 is modified to read:
All pipe used for the installation, extension, alteration, or repair of any gas piping shall be standard weight wrought iron or steel (galvanized or black) or yellow brass (containing not more than 75 percent copper) or listed corrugated stainless steel tubing systems for interior use only. Approved PE pipe may be used in exterior buried piping systems. Exception: CSST piping installed outside a building shall be sleeved, or shall be installed with protection from mechanical damage equivalent of that required for CSST piping within the building. When installed underground CSST shall be sleeved and shall have a minimum burial depth of 18 inches (457.2 mm).
2. Sec. 1211.3 modify the exception to read:
Exception: when necessary due to structural conditions, approved type gas piping may be installed in other locations, when permission has first been obtained from the administrative authority. Natural gas piping (L.P. gas piping excluded) may be installed under a slab in accordance with Illustration A when building conditions prevent above-slab installation.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

Illustration A. Gas Pipe Installation



Historical Note

New Illustration made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-113. Chapter 13, Special Piping and Storage Systems

This chapter has no modifications.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-114. Chapter 14, Referenced Standards

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

Table 14-1. Add standards in alphabetical order listed under appropriate sections. Refer to Table A - Plumbing Material Standards. These standards are incorporated by reference. This

incorporation by reference does not include any later amendments or editions. Copies of the incorporated material are on file with the Arizona Uniform Plumbing Code Commission and the Office of the Secretary of State. Add three new rows to Table A. Refer to Table A – Plumbing Material Standards.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

Table A. Plumbing Material Standards

Materials and Products	ANSI	ASTM	FS	IAPMO	Other Standards	Footnote Remarks
NONMETALLIC PIPE: Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe		F1281-01e1 *		C-3388	NSF 14 NSF 61	
Polyethylene-Aluminum-Polyethylene (PE-AL-PE) Pressure Pipe		F1282-02e1 *		C-3389	NSF 14 NSF 61	
Metal insert fittings for Polyethylene-Aluminum-Polyethylene (PE-AL-PE) and Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX) Composite Pressure Pipe		F1974-01e1 *		C-3846	NSF 14 NSF 61	
NONMETALLIC PIPE: Metal insert fittings utilizing a copper crimp ring for SDR9 Cross-Linked Polyethylene (PEX) tubing. Cold Expansion Fitting with PEX reinforcing ring for use with SDR-9 Cross-Linked Polyethylene (PEX Tubing)		F1807-97 F1960-99				
PLUMBING FIXTURES: Waterless Urinals	Z124.9			C-3346		
Note: * Published by the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.						

Historical Note

New Table A made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-115. Reserved**R4-48-116. Reserved****R4-48-117. Reserved****R4-48-118. Reserved****R4-48-119. Appendix A, Recommended Rules for Sizing the Water Supply System**

This appendix has no modifications.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-120. Appendix B, Explanatory Notes on Combination Waste and Vent Systems

This appendix has no modifications.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-121. Appendix C, Minimum Plumbing Facilities

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

The third paragraph of Appendix C is added to read: "Those jurisdictions that have not adopted a building code which stipulates minimum plumbing facilities shall utilize Appendix C of the 1994 UPC when establishing plumbing facility requirements."

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-122. Appendix D, Rainwater Systems

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

- Appendix D 1 (a) is modified to read:
Rainwater piping placed within the interior of a building or run within a vent or shaft shall be of cast iron, galva-

nized steel, wrought iron, brass, copper, lead, Schedule 40 ABS DWV, Schedule 40 PVC DWV, or other approved materials, and changes in direction shall conform to the requirements of Section 706.0.

- Appendix D1.1(c) is modified to read: Roof drains, overflow drains, and rainwater piping installed within the building shall be tested in conformity with the provisions of this Code for testing drain, waste, and vent systems.
- Appendix D3.3 is modified to read: Horizontal Rainwater Piping. Horizontal Rainwater Piping shall be sized in accordance with Table D-2. Exception: The potential head of water which may rise in the vertical drain pipe (tailpiece) may be used to reduce the horizontal pipe size and its slope if the head (rise) is sufficient when calculated as follows:

- If the head ('h') is equal to or greater than 3/8 inch for each foot (31.35 mm/m) of horizontal pipe length, the horizontal pipe may be pitched at 1/8 inch slope (10.45 mm/m), but sized according to the 1/2 inch slope (41.8 mm/m) table.
- If the head ('h') is equal to or greater than 1/8 inch for each foot (10.45 mm/m) of horizontal pipe length, the horizontal pipe may be pitched at 1/8 inch slope (10.45 mm/m), but sized according to the 1/4 inch slope (20.9 mm/m) table. (See Illustration A).

EXAMPLE #1: Roof Area – 4800 Square Feet (445.9 m²)

Maximum Rainfall/Hour - Six Inches (152.4 mm/h)

Pipe Laid at 1/8 inch Slope (10.45 mm/m)

Using the 1/2 inch slope (41.8 mm/m) table, the horizontal pipe size will be six inches.

The available static head ('h') needed to allow use of the 1/2 inch (41.8 mm/m) table is calculated as follows:

3/8 inch of head pressure per foot (31.35 mm/m) of horizontal pipe run becomes 3/8-inch x 100 feet

= 300/8ths, or 'h' = 37 1/2 inches (952.5 mm).

NOTE: Sizing from the 1/8 inch (10.45 mm per m) table would have required the horizontal pipe size to be eight inches (203.2 mm), rather than the six inches (152.4 mm) made possible by use of the 1/2 inch (41.8 mm/m) slope table.

EXAMPLE #2: Roof Area – 6000 Square Feet

Maximum Rainfall/Hour – six Inches (152.4 mm)

Pipe Laid at 1/8 inch Slope (10.45 mm/m)

Using the 1/4 inch slope (20.9 mm/m) table the horizontal pipe size will be eight inches (203.3 mm). The available static head ('h') needed to allow use of the 1/4 inch (20.9 mm/m) table is calculated as follows: 1/8 inch of head pressure per foot (10.45 mm per m) of horizontal pipe run becomes 1/8-inch x 100 feet = 100/8ths, or 'h' = 12 1/2 inches (317.5 mm). NOTE: Sizing

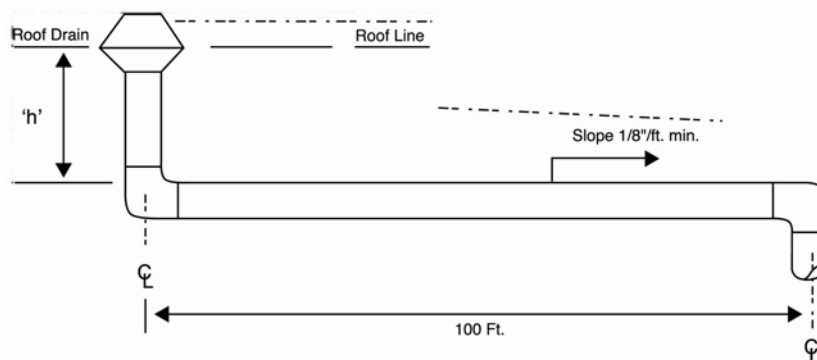
from 1/8 inch (10.45 mm per m) table would have required the horizontal pipe size to be 10 inches (254.0 mm) rather than the eight inches (203.2 mm) made possible by use of the 1/4 inch slope (20.9 mm/m) table.

- (c) If the head ('h') is equal to or greater than 10 feet (3.05 m) (for example, base of a stack), all horizontal pipe downstream of any such vertical section may be the same size as the vertical pipe to which it is connected.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

Illustration A. Horizontal Rainwater Piping



Historical Note

New Illustration A made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-123. Appendix E, Manufactured or Mobile Home Parks and Recreational Vehicle Parks

This appendix has no modifications.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-124. Appendix F, Medical Gas Systems

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. Appendix F Medical Gas Systems. Current language is deleted and replaced with the following sections of NFPA #99, Health Care Facilities (1996 Edition) as amended by this section, which are incorporated by reference. The incorporation by reference does not include any later amendments or editions. Copies of the incorporated material are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02169, and are on file with the Office of the Secretary of State:

F1 Scope

- (a) The provisions herein shall apply to the installation, testing, and certification of medical gas and vacuum piping for safe use in-patient care hospitals, clinics, and other health care facilities.
- (b) The purpose of this appendix is to provide minimum requirements for the installation, testing, and certification

of medical gas and medical vacuum systems, from the point of supply to the user outlets or inlets. These provisions do not cover portable systems or cylinder storage requirements.

- F2 All medical gas and vacuum piping systems are to be installed and inspected based upon applicable language found in the following chapters of NFPA #99, Health Care Facilities (1996 edition):

Chapter 1. Introduction.

1-1 Scope

1-2 Application. (Use first paragraph; delete second paragraph)

1-3 Intended Use

1-4 Discretionary Powers of Authority Having Jurisdiction

1-5 Interpretations

1-6 Organization of This Document (subsections 1-6.1, 1-6.2, and 1-6.3)

1-7 Metric Units

1-8 Effective Date

1-9 Preface

Add Sec. 1-10 to read: Sections of NFPA 99, 1996 edition, which are not referenced are not mandated by the Arizona Uniform Plumbing Code.

Chapter 2. Definitions.

2-1 Official NFPA Definitions

2-2 Definitions of Terms Used in the Standard	
Chapter 4. Gas and Vacuum Systems.	
4-3.1.1.2 Storage Requirements (Location, Construction, Arrangement)	
4-3.5 Administration - Level 1	
4-3.5.1 Responsibility of Governing Body	
4-3.5.2 Gas System Policies - Level 1	
4-3.5.2.1 Gases in Cylinders and Liquefied Gases in Containers - Level 1	
4-3.5.2.2 Storage of Cylinders and Containers - Level 1	
4-3.5.2.3 Patient Gas Systems - Level 1	
4-3.5.3 Gas Systems Recordkeeping - Level 1	
4-3.5.4 Gas Systems Information and Warning Signs - Level 1	
4-3.5.4.1 (No Heading)	
4-3.5.4.2 (No Heading)	
4-3.5.4.3 (No Heading)	
4-3.5.5 Gas System Transport and Delivery - Level 1	
4-3.5.5.1 (No Heading)	
4-3.5.5.2 (No Heading)	
4-3.5.6 Vacuum Systems Policies - Level 1	
4-3.5.6.1 Patient Vacuum Systems	
4-3.5.7 Vacuum System Recordkeeping - Level 1	
4-3.5.8 Vacuum System Information and Warning Signs - Level 1	
4-3.5.8.1 Piping Distribution System	
4-3.5.8.2 Gauge Identification	
4-3.5.9 WAGD System Policies - Level 1	
4-3.5.9.1 Maintenance	
4-3.5.9.2 Performance Tests	
4-4 Level 2 Piped Systems	
4-4.1 Piped Gas Systems - Level 2	
4-4.2 Piped Vacuum Systems - Level 2	
4-4.3 Piped WAGD Systems - Level 2	
4-4.4 Performance Criteria and Testing - Level 2	
4-4.5 Administration - Level 2	
4-5.5 Administration - Level 3	
4-5.5.1 Responsibility of Governing Body	
4-5.5.2 Gas System Policies - Level 3	
4-5.5.2.1 (No Heading)	
4-5.5.2.2 (No Heading)	
4-5.5.2.3 Patient Gas Systems - Level 3	
4-5.5.3 Gas System Recordkeeping - Level 3	
4-5.5.4 Gas System Information and Warning Signs - Level 3	
4-5.5.5 Gas System Transport and Delivery - Level 3	
4-5.5.6 Vacuum System Policies - Level 3	
4-5.5.7 Vacuum System Recordkeeping - Level 3	
4-5.5.8 Vacuum System Information and Warning Signs - Level 3	
4-5.5.9 WAGD System Policies - Level 3	
4-6.5 Administration - Level 4	
Chapter 12. Hospital Requirements.	
12-1 Scope	
12-3.4 Gas and Vacuum System Requirements	
12-3.4.1 (No Heading)	
12-3.4.2 (No Heading)	
12-3.4.3 (No Heading)	
12-3.4.4 (No Heading)	
12-3.4.5 (No Heading)	
Chapter 13. Ambulatory Health Care Center Requirements.	
13-1 Scope	
13-3.4 Gas and Vacuum System Requirements	
13-3.4.1 (No Heading)	

13-3.4.2 (No Heading)	
13-3.4.3 (No Heading)	
13-3.4.4 (No Heading)	
13-3.4.5 (No Heading)	
Chapter 14. Clinic Requirements.	
14-1 Scope	
14-3.4 Gas and Vacuum System Requirements	
14-3.4.1 (No Heading)	
14-3.4.2 (No Heading)	
14-3.4.3 (No Heading)	
14-3.4.4 (No Heading)	
14-3.4.5 (No Heading)	
Chapter 15. Medical and Dental Office Requirements.	
15-1 General	
15-1.1 Scope	
15-1.2 Applicability	
15-3.4 Gas and Vacuum System Requirements	
15-3.4.1 (No Heading)	
15-3.4.2 (No Heading)	
15-3.4.3 (No Heading)	
15-3.4.4 (No Heading)	
15-3.4.5 (No Heading)	
15-3.4.6 (No Heading)	
15-3.4.7 (No Heading)	
15-3.4.8 (No Heading)	
15-3.4.9 (No Heading)	
Chapter 16. Nursing Home Requirements.	
16-1 Scope	
16-3.4 Gas and Vacuum System Requirements	
16-3.4.1 (No Heading)	
16-3.4.2 (No Heading)	
Chapter 17. Limited Care Facility Requirements.	
17-1 Scope	
17-3.4 Gas and Vacuum System Requirements	
17-3.4.1 (No Heading)	
17-3.4.2 (No Heading)	
Chapter 19. Hyperbaric Facilities.	
19-1 Introduction and Scope	
19-3.3.3 (No Heading)	
19-3.3.5 (No Heading)	

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-125. Appendix G, Graywater Systems for Single Family Dwellings

- A.** Appendix G of the International Association of Plumbing and Mechanical Officials' (I.A.P.M.O.) Uniform Plumbing Code (1994 Edition) is incorporated by reference. This incorporation by reference does not include any later amendments or editions. Copies of the incorporated material are available from I.A.P.M.O. at 20001 Walnut Drive South, Walnut, CA, 91789-2825 and are on file with the Arizona Uniform Plumbing Code Commission and the Office of the Secretary of State. Notwithstanding any other provision of R4-48-125, the provisions of R4-48-125 do not require an Administrative Authority to act in a manner that conflicts with other provisions of state law or duplicates any act required by other provisions of state law.
- B.** Appendix G, incorporated by subsection (A) is modified as follows:
- Appendix G1(b) is modified to read: "The type of system shall be determined on the basis of location, soil type, absorption rate, soil classification, and depth to ground water below the land surface, and shall be designed to accept only graywater connected to the system from the

- residential building. The system, except as otherwise approved, may consist of a holding tank or tanks and shall discharge graywater into subsurface irrigation/disposal fields.”
2. Appendix G1(d) is modified to read: “No permit for any graywater system shall be issued until a plot plan with appropriate data, as required by Section G4, has been submitted and approved. When there is insufficient lot area or inappropriate soil conditions for adequate absorption of the graywater, as determined by the Administrative Authority, no graywater system shall be permitted. No permit shall be issued for the irrigation/disposal field of a graywater system that does not meet the criteria specified in this Appendix until appropriate data satisfactory to the Administrative Authority have been submitted and approved.”
 3. Appendix G1(g) is added to read: “When making the initial site investigation and determining the soil characterization and soil absorption rates for graywater systems, the standards in subsections (a) through (c) are incorporated by reference and the standards in subsections (a) through (d), or equivalent methods or standards approved by the Administrative Authority shall be used. The incorporations do not include later amendments or editions and are available from Registrar of Contractors and are on file with the Office of the Secretary of State:
 - a. ASTM D-5879-95, “Standard Practice for Surface Site Characterization for On-Site Septic Systems;”
 - b. ASTM D-5921-96, “Standard Practice for Subsurface Site Characterization of Test Pits for On-Site Septic Systems;”
 - c. ASTM D-1452-80 (Reapproved 1995), “Standard Practice for Soil Investigation and Sampling by Auger Borings,” may be used in areas where the depth to groundwater may be within the required vertical separation from the bottom of the subsurface disposal field for graywater systems, based on the factors in the standard,” or
 - d. Percolation testing, as specified in Appendix I of this Code.
 4. Appendix G2 is modified to read: “Graywater is untreated household water which has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins, and water from clothes-washing machines and laundry tubs. It shall not include wastewater from kitchen sinks, dishwashers, or deleterious chemicals such as discharge from photo lab sinks.”
 5. Appendix G4(a) is modified to read: “A site-specific plot plan drawn to scale completely dimensioned, showing lot lines and structures, direction and approximate slope of surface (2 foot (0.6 m) contour lines), location of all present or proposed retaining walls, drainage channels, water supply lines, wells, paved areas and structures on the lot, number of bedrooms and plumbing fixtures in each structure, location of private sewage disposal system and 100% expansion area, or building sewer connection to the public sewer, and location of the proposed graywater system.”
 6. Appendix G4(b) is modified to read: “Details of construction, including system profile and construction sections necessary to assure compliance with the requirements of this Appendix, together with a full description of the complete installation, including installation methods, construction, and materials as required by the Administrative Authority.”
 7. Appendix G4(c) is modified to read: “A log of soil formations, percentage of rock, texture, structure, consistence, and mottles as provided in ASTM D-5921-96, depth to groundwater below the land surface as determined by test holes dug in close proximity to any proposed irrigated area (using, for example, published groundwater data, subdivision reports, or relevant well data), soil classification, or percolation test results to determine equivalent function of subsurface irrigation/disposal field. Other information acceptable to the Administrative Authority may be used to obtain soil performance equivalent to that achieved by the standards or methods specified in Section G1(g).”
 8. Appendix G5(a)(1) is modified to read: “All applicable provisions of this Appendix and the inspection requirements shall be complied with. The Administrative Authority shall confirm the soil suitability for a graywater system, inspect the disposal area following excavation, and inspect the piping system installation.”
 9. Appendix G5(a)(3) is modified to read: “Holding/surge tanks shall be installed on dry, level, well-compacted soil if underground, or on a level 3 inch (76.2 mm) concrete slab, if above ground.”
 10. Appendix G5(a)(4) is modified to read: “Above ground holding/surge tanks of cylindrical design shall be anchored against overturning.”
 11. Appendix G5(b)(1) is modified to read: “Holding/surge tanks shall be filled with water to the overflow line prior to and during inspection. All seams and joints shall be left exposed and the tank shall remain watertight.”
 12. Appendix G5(b)(2) is modified to read: “A flow test shall be performed through the system to the point of graywater irrigation/disposal. All conveyance lines and components shall be watertight.”
 13. Appendix G7 is modified to read: “Each irrigation zone shall have the minimum effective irrigation area in square feet as determined by Table G-2 for the type of soil found in the excavation, based upon a calculation of estimated graywater discharge pursuant to Section G-6 of this Appendix. The effective area of the irrigation/disposal zone shall be equal to the aggregate length of the perforated pipe sections within the irrigation zone times the width of the proposed irrigation/disposal zone. Each proposed graywater system shall include at least one irrigation zone. Each zone shall be in compliance with the provisions of this section. No excavation for an irrigation/disposal field shall extend to a depth where graywater may contaminate the groundwater or surface water. The minimum vertical separation distance from the bottom of the irrigation zone shall be at least 1 foot (0.30 m) of normally unsaturated soil.”
 14. Appendix G8(a) is modified to read: “Irrigation/disposal field size shall be computed from Table G-2. Rock fragments as defined by ASTM D-5921-96 shall be excluded from the field sizing.”
 15. Appendix G8(c) is modified to read: “When a percolation test is used, no graywater system shall be permitted if the test shows the absorption capacity of the soil is outside the range of two minutes per inch (0.79 minutes per cm) to 60 minutes per inch (23.6 minutes per cm). Soils with excessively high or low permeability are unsuitable.”
 16. Appendix G9 is modified to read: “Holding/Surge Tank Construction”
 17. Appendix G9(a) is modified to read: “Plans for holding/surge tanks, if utilized, shall be submitted to the Administrative Authority for approval. Such plans shall show all

- dimensions and such other pertinent data as may be required. A minimum capacity of 50 gallons (189.2 L) is required, when a holding/surge tank is utilized.”
18. Appendix G9(b) is modified to read: “Holding/surge tanks shall be constructed of solid durable materials, not subject to excessive corrosion or decay, and shall be watertight.”
 19. Appendix G9(c) is modified to read: “Each holding/surge tank shall be vented as required by Chapter 9 of this Code and shall have a locking, gasketed access opening, or approved equivalent, to allow for inspections and cleaning.”
 20. Appendix G9(d) is modified to read: “Each holding/surge tank shall have its rated capacity permanently marked on the unit. In addition, a sign “GRAYWATER IRRIGATION SYSTEM, DANGER – UNSAFE WATER” shall be permanently marked on the holding/surge tank.”
 21. Appendix G9(e) is modified to read: “Each holding/surge tank installed above ground shall have an emergency drain, separate from that connecting the tank with the irrigation/disposal fields, and an overflow drain. The emergency and overflow drains shall have permanent connections to the building drain or building sewer, upstream of the septic tanks, if any. The overflow drain shall not be equipped with a shutoff valve.”
 22. Appendix G9(f) is modified to read: “The overflow and emergency drain pipes shall not be less in size than that of the inlet pipe. The vent size shall be determined based on the total graywater fixture units, as outlined in Table 7-5 of this Code. Unions or equally effective fittings shall be provided for all piping connected to the holding/surge tank.”
 23. Appendix G9(g) is modified to read: “Each holding/surge tank shall be structurally designed to withstand all anticipated earth or other loads. All holding/surge tank covers shall be capable of supporting an earth load of not less than 300 pounds per square foot (14.4 kPa) when the tank is designed for underground installation.”
 24. Appendix G9(h) is modified to read: “If a holding/surge tank is installed underground, the system must be designed so that the tank overflow will gravity drain to the existing sewer line or septic tank. The tank shall be protected against sewer line backflow by a backwater valve.”
 25. Appendix G9(i)(1) is modified to read: “Steel holding/surge tanks shall be protected from corrosion, both externally and internally, by a coating acceptable to the Administrative Authority.”
 26. Appendix G9(i)(2) is modified to read: “Holding/surge tanks constructed of concrete, fiberglass or alternative material may be approved by the Administrative Authority.”
 27. Appendix G10 is modified to read: “Graywater piping discharging into the holding/surge tank or having a direct connection to the sanitary drain or sewer piping shall be downstream of an approved waterseal type trap or traps. If no such trap or traps exist, an approved vented running trap shall be installed upstream of the connection to protect the building from any possible waste or sewer gases. All graywater piping shall be marked or shall have a continuous tape marked with the words “DANGER – UNSAFE WATER.” All valves, including the 3-way valve, shall be readily accessible and shall be approved by the Administrative Authority. A backwater valve, installed pursuant to this Code, shall be provided on all holding/surge tank drain connections to the sanitary drain or sewer piping.”
 28. Appendix G11(b) is modified to read: “Aggregate or clean stone, varying in size from 3/4 inch (19.1 mm) to 2-1/2 inches (63.5 mm) shall be placed in the trench to the depth and grade required by this section. The perforated section shall be laid on the aggregate in an approved manner. The perforated section shall then be covered with aggregate to the minimum depth required by this section. The aggregate shall then be covered with geotextile or landscape filter fabric materials, or similar porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the aggregate cover until after inspection and acceptance.”
 29. Appendix G11(c) is modified. Refer to Table A.
 30. Appendix G12(a) is modified to read: “Other collection and distribution systems may be approved by the Administrative Authority as allowed by Section 301.0 [Standards and Alternatives] of this Code.”
 31. Appendix G12(b) is modified to read: “Nothing contained in this appendix shall be construed to prevent the Administrative Authority from requiring an alternative design if the Administrative Authority determines that the first submitted design will not maintain a safe and sanitary condition.”
 32. Table G-1 is modified. Refer to Table B – Location of Graywater System and Setback Requirements.
 33. Table G-2 is modified. Refer to Table C – Effluent Application Loading Rates to Soil for Graywater Systems.
 34. Figure G-1 is modified. Refer to Illustration A – Graywater System Tank – Gravity.
 35. Figure G-2 is modified. Refer to Illustration B – Graywater System Tank – Pumped.
 36. Figure G-3 is modified. Refer to Illustration C – Graywater System Multiple Tank Installation.
 37. Figure G-4 is modified. Refer to Illustration D – Graywater System Underground Tank – Pumped.
 38. Figure G-5 is modified. Refer to Illustration E – Graywater System Typical Irrigation Zone Layout.

Historical Note

New Section adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).
Amended by final rulemaking at 7 A.A.R. 1458, effective March 16, 2001 (Supp. 01-1).

Table A. Irrigation Disposal Fields

Irrigation/disposal fields shall be constructed as follows:

	Minimum	Maximum
Number of perforated drain lines per irrigation zone	1	--
Length of each perforated drain line	--	100 ft. (30.5 m)
Bottom width of trench	6 in. (15.2 cm)	24 in. (61.0 cm)
Spacing of lines, center-to-center	4 ft. (1/2 m)	--
Depth of earth cover over aggregate	9 in. (22.9 cm)	
Depth of aggregate cover over the lines	2 in. (5.1 cm)	--
Depth of aggregate beneath lines	3 in. (7.6 cm)	--
Grade of perforated lines	Level	3 in./100 ft. (7.6 cm/30.5 m)
Total depth of trench	17 in. (43.1 cm)	24 in. (61 cm)

Historical Note

Table A adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

Table B. Location of Graywater System and Setback Requirements

Minimum Horizontal Distance in Clear Required From:	Holding/Surge Tank (feet)(meters)	Irrigation/Disposal Field (feet)(meters)
Building structures (see footnote 1)	5 ft. (1.5 m) (see footnote 2)	2 ft. (0.6 m) (see footnote 3)
Property line adjoining private property	5 ft. (1.5 m)	(see footnote 4)
Water supply wells (see footnote 5)	100 ft. (30.5 m)	100 ft. (30.5 m)
Streams, lakes, and reservoirs (see footnote 5)	100 ft. (30.5 m)	100 ft. (30.5 m) (see footnote 6)
Domestic water source (see footnote 7)	200 ft. (61.0 m)	200 ft. (61.0 m)
Dry wash/drainage easements (see footnote 10)	50 ft. (15.2 m)	50 ft. (15.2 m)
Sewage pits	5 ft. (1.5 m)	5 ft. (1.5 m)
Disposal field and 100% expansion area	5 ft. (1.5 m)	4 ft. (see footnote 8)
Septic tank	0 ft.	5 ft. (1.5 m)
On-site domestic water service line	5 ft. (1.5 m)	5 ft. (1.5 m)
Pressurized public water main	10 ft. (3.0 m)	10 ft. (3.0 m) (see footnote 9)

Notes: When irrigation/disposal fields are installed in sloping ground, the minimum horizontal distance between any part of the distribution system and the ground surface shall be 15 feet (4.6 m).

- 1 Including porches and steps, whether covered or uncovered, breezeways, roofed patios, carports, covered walks, covered drive-ways and similar structures or appurtenances.
- 2 The distance may be reduced to 0 feet for above-ground tanks when first approved by the Administrative Authority.
- 3 Assumes a 45° angle from foundation.
- 4 The setback requirement is 5 feet (1.5 m) unless the property is not served by a central system for the distribution of water and: There is no existing or proposed individual well on adjoining private property, in which case the setback is 50 feet (15.2m); or
 - a. A 100-foot (30.5m) separation distance cannot be maintained from an existing or proposed individual well, in which case the setback is the distance necessary to maintain the 100-foot (30.5m) separation; or
 - b. The applicable setback requirement in (a) or (b) may be reduced to a minimum of 5 feet (1.5m) with a variance from the Administrative Authority.
- 5 Where special hazards are involved, the distance required shall be increased as may be directed by the Administrative Authority.

- 6 These minimum clear horizontal distances shall also apply between the irrigation/disposal field and the maximum lake or reservoir level.
- 7 A point of water intake or suction pipeline from any stream, lake, or reservoir that is used for the purpose of providing water for human consumption.
- 8 Plus 2 feet (0.6 m) for each additional foot (meter) of depth in excess of 1 foot (0.3 m) below the bottom of the drain line.
- 9 For parallel construction/for crossings, approval by the Administrative Authority shall be required.
- 10 50-foot (15.2 m) setback is measured from the edge of the defined natural channel bank for a drainage area of at least five acres (2 hectare) or a drainage easement, whichever is less. Setback may be reduced to 25 feet (7.6 m) up gradient from the system, if channel erosion protection is provided (naturally or man-made) and approved by the Administrative Authority.

Historical Note

Table B adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

Table C. Effluent Application Loading Rates to Soil for Graywater Systems

Instructions: Read questions in sequence beginning with A. The maximum soil loading rate in gallons per day per square foot (gpd/sq. ft.) (Lpd/sq. m.) corresponds to the first "yes" response to the questions.

	Soil Application Rates gpd/sq. ft. (Lpd/sq. m.)	Percolation Rate Range minutes/inch (min./cm.)
A. Is the horizon gravelly coarse sand or coarser?	0 (0) (footnote 1)	--
B. Is the structure of the horizon moderate or strongly platy?	0 (0) (footnote 1)	--
C. Is the texture of the horizon sandy clay loam, clay loam, silty clay loam, or finer and structure weak and platy?	0 (0) (footnote 1)	--
D. Is the moist consistence stronger than firm or any cemented class?	0 (0) (footnote 1)	--
E. Is texture sandy clay, clay, or silty clay of high clay content and structure massive or weak?	0 (0) (footnote 1)	--
F. Is texture sandy clay loam, clay loam, silty clay loam, or silty loam and structure massive?	0 (0) (footnote 1)	--
G. Is the texture of the horizon loam or sandy loam and the soil structure massive?	.20 (8.15)	16-45 (6.3-17.7)
H. Is texture sandy clay, clay or silty clay of low clay content and the structure moderate or strong?	.20 (8.15)	45-60 (17.7-23.6)
I. Is texture sandy clay loam, clay loam, or silty loam and structure weak?	.20 (8.15)	45-60 (17.7-23.6)
J. Is texture sandy clay loam, clay loam, or silty clay loam and structure moderate or strong?	.40 (16.30)	45-60 (17.7-23.6)
K. Is texture sandy loam, loam, silty loam and structure weak?	.40 (16.30)	16-45 (6.3-17.7)
L. Is texture sandy loam, loam, silty loam and structure moderate or strong?	.60 (24.45)	16-45 (6.3-17.7)
M. Is texture fine sand, very fine sand, loamy fine sand, or loamy very fine sand?	.40 (16.30)	10-30 (3.9-11.8)
N. Is texture loamy sand or sand?	.80 (32.59)	10-20 (3.9-7.9)
O. Is texture coarse sand?	1.20 (48.89)	2-10 (0.8-3.9)

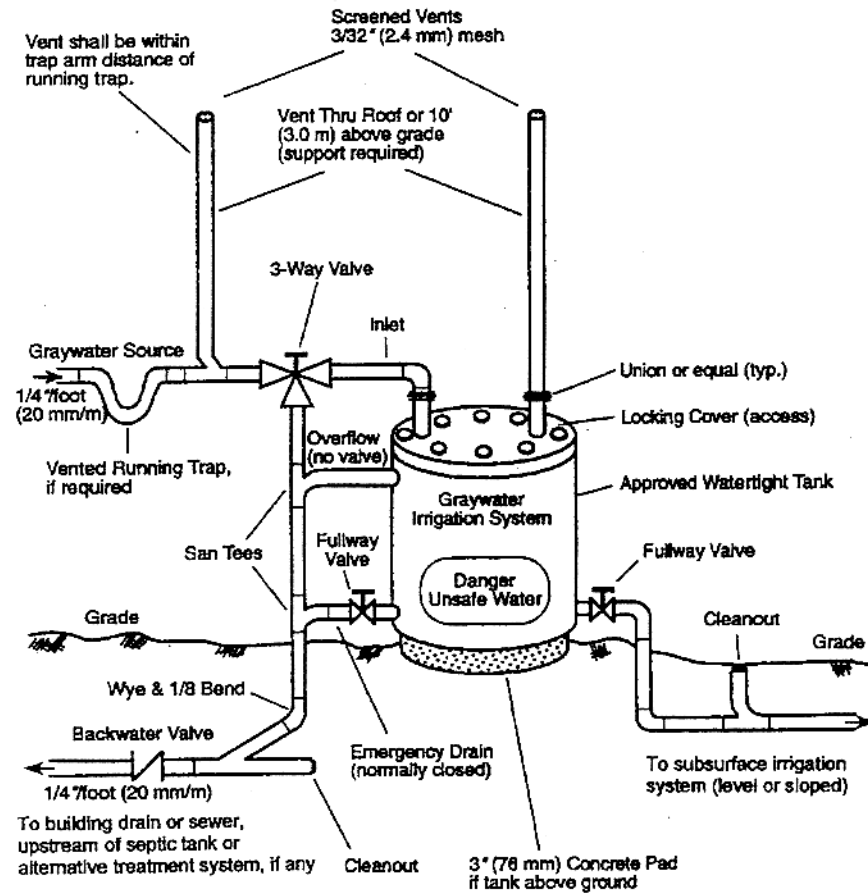
Notes:

- 1 Graywater systems for these soil types shall comply with paragraph G12(a) and G12(b) of this appendix.

Historical Note

Table C adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

Illustration A. Graywater System Tank - Gravity



Historical Note

Illustration A adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

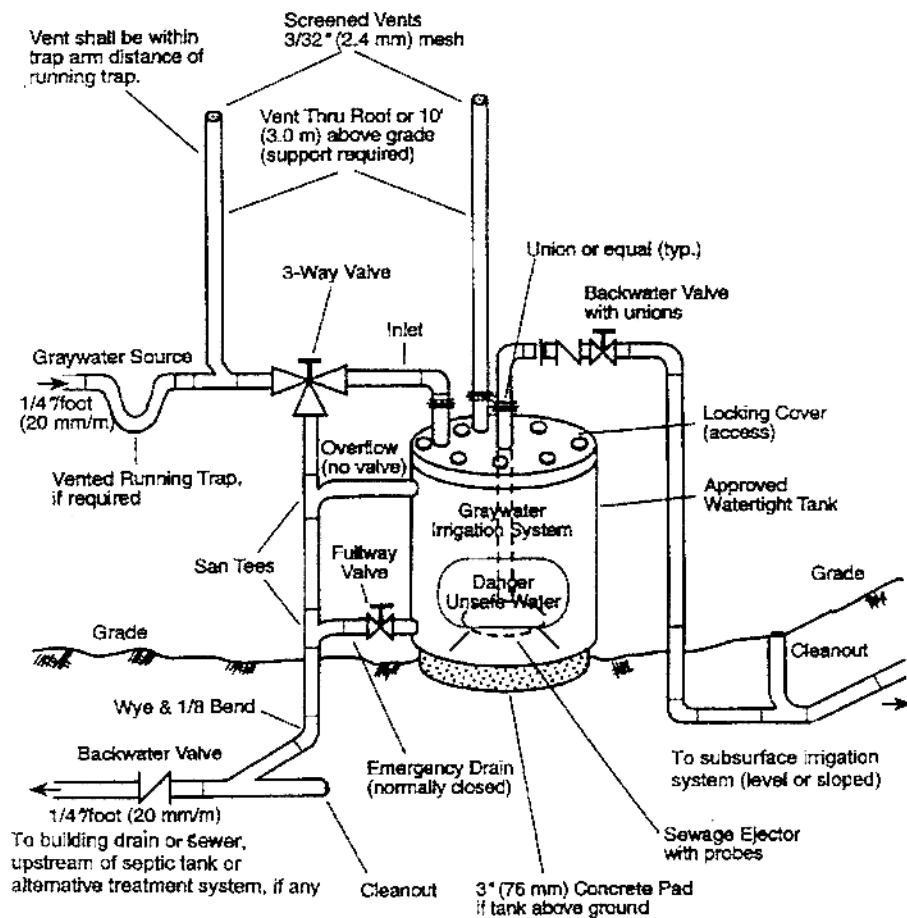
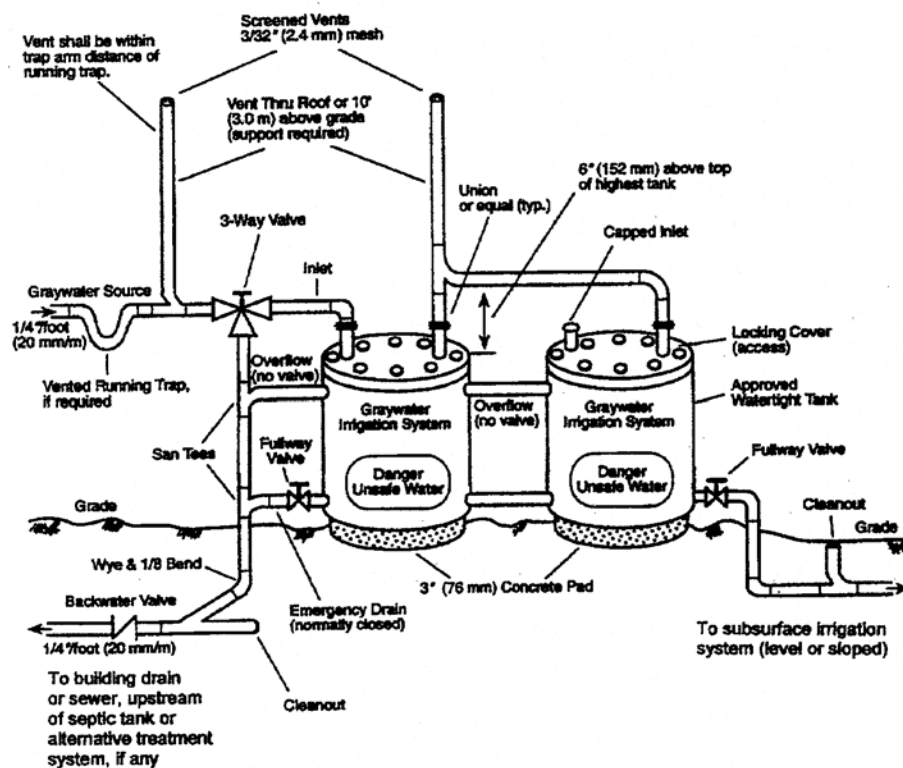
Illustration B. Graywater System Tank - Pumped**Historical Note**

Illustration B adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

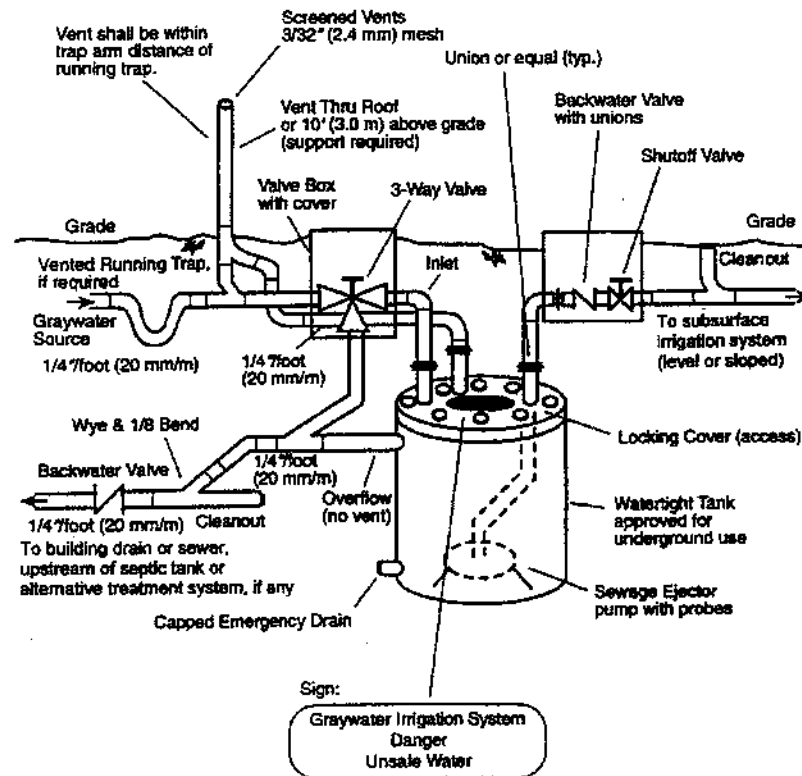
Illustration C. Graywater System Multiple Tank Installation



Historical Note

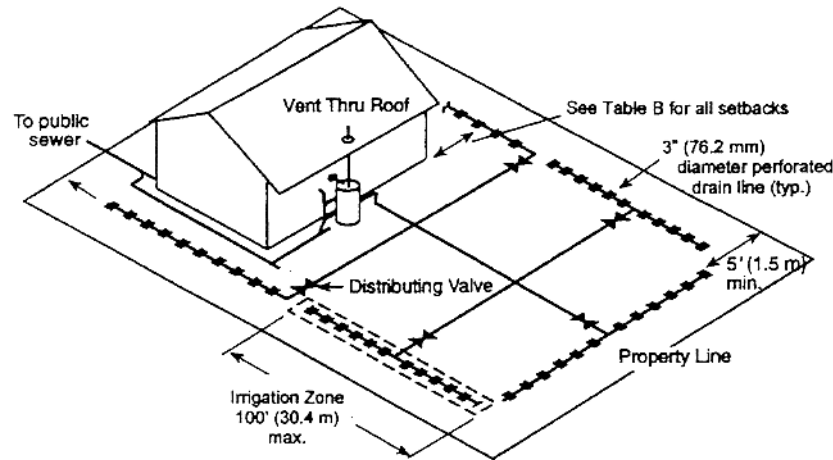
Illustration C adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

Illustration D. Graywater System Underground Tank – Pumped



Historical Note

Illustration D adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

Illustration E. Graywater System Typical Irrigation Zone Layout

Note: Each irrigation zone shall have a minimum effective absorption/irrigation area in square feet predicated on the estimated graywater discharge in gallons per day and on the type of soil found in the area. The area of the field shall be equal to the aggregate length of perforated pipe sections within the irrigation zone times the width of the proposed zone.

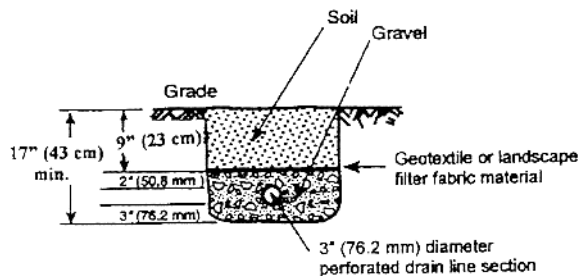
**Historical Note**

Illustration E adopted by final rulemaking at 6 A.A.R. 167, effective December 16, 1999 (Supp. 99-4).

R4-48-126. Appendix H, Procedures for Sizing Commercial Kitchen Grease Interceptors

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

Appendix H 2 (a) is modified to read: Interceptors shall be constructed in accordance with the design approved by the Administrative Authority and shall have a minimum of two compartments with fittings designed for grease retention. Grease interceptors shall be constructed of solid durable materials, not subject to excessive corrosion or decay, and shall be watertight.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3).

R4-48-127. Appendix I, Private Sewage Disposal Systems

In accordance with A.R.S. § 41-619(B)(4), the Arizona Uniform Plumbing Code Commission adopts Appendix I of the International Association of Plumbing and Mechanical Officials' (I.A.P.M.O.)

Uniform Plumbing Code (1994 Edition) as modified in Appendix A. Notwithstanding any other provision of R4-48-127, the provisions of R4-48-127 do not require an Administrative Authority to act in a manner that conflicts with other provisions of state law or duplicates any act required by other provisions of state law.

Historical Note

New Section adopted by final rulemaking at 7 A.A.R. 1458, effective March 16, 2001 (Supp. 01-1).

Appendix A. Modified Appendix I**I 1 Private Sewage Disposal - General**

- (a) Where permitted by Section 713.0, the building sewer may be connected to a private sewage disposal system complying with the provisions of this appendix. The type of system shall be determined on the basis of location, soil absorption rate, soil classification, and depth to the ground water below the land surface and shall be designed to receive all sewage from the property. The system, except as otherwise approved, shall consist of a septic tank with effluent discharging into a subsurface disposal field, into one or more seepage pits, or into a combi-

nation of subsurface disposal field and seepage pits. The Administrative Authority may grant exceptions to the provisions of this appendix for permitted structures which have been destroyed due to fire or natural disaster, and which cannot be reconstructed in compliance with these provisions.

- (b) Where the quantity or quality of the sewage is such that the above system cannot be expected to function satisfactorily; for commercial, agricultural, and industrial plumbing systems; for installations where appreciable amounts of industrial or indigestible wastes are produced; for occupancies producing abnormal quantities of sewage or liquid waste; or when grease interceptors are required by other parts of this Code, the method of sewage treatment and disposal shall be first approved by the Administrative Authority. Special sewage disposal systems for minor, limited, or temporary uses shall be first approved by the Administrative Authority. This appendix applies only to systems with an inflow of 3000 gallons (11,355 liters) per day or less.
- (c) Disposal systems shall be designed to utilize the most porous or absorptive portions of the soil formation. Where the depth to the ground water extends to within the specified minimum vertical separation for the proposed system, a private sewage disposal system shall not be installed.
- (d) The minimum vertical separation from the bottom of the disposal field or seepage pit shall be as specified in Tables I-4 (A), I-4 (B), I-5 or I-7.
- (e) When making a site investigation and determining the soil characterization and soil absorption rates for private sewage disposal systems and alternative private sewage treatment and disposal systems, an investigator shall use one or more of the following standards, including (1) through (7), incorporated by reference, or methods or equivalent standards approved by the Administrative Authority. The incorporated standards do not include later amendments or editions and are available from the Registrar of Contractors and the Office of the Secretary of State:
 - (1) ASTM D 5879-95, "Standard Practice for Surface Site Characterization for On-Site Septic Systems";
 - (2) ASTM D 5921-96, "Standard Practice for Subsurface Site Characterization of Test Pits for On-Site Septic Systems";
 - (3) ASTM D 1452-80 (Reapproved 1995), "Standard Practice for Soil Investigation and Sampling by Auger Borings." This method shall be used in areas if the depth to groundwater may be within the required minimum vertical separation from the bottom of the subsurface disposal field for the private sewage disposal system;
 - (4) ASTM C1227-00, "Standard Specification for Precast Concrete Septic Tanks";
 - (5) IAPMO PS1-93, "Material and Property standard for Prefabricated Septic Tanks";
 - (6) ACI 318-99, "Building Code Requirements for Structural Concrete" and ACI 318R-99, "Commentary";
 - (7) ACI 350R-89, "Environmental Engineering Concrete Structures", or
 - (8) Percolation testing as specified in Section I 15.
- (f) A site investigation shall include a log of soil formations, percentage of rock, texture, structure, consistence, and mottles as provided in ASTM D-5921-96, depth to ground water below the land surface as determined by test holes dug in close proximity to any proposed disposal field or seepage pit (for example, published groundwater data, subdivision reports, or relevant well data), soil classification, or percolation test results. Other information acceptable to the Administrative Authority may be utilized to determine soil performance equivalent to that achieved by the standards or methods specified in Section I 1 (e).

- (g) All private sewage disposal systems shall be so designed that additional seepage pits or subsurface drain fields, equivalent to at least 100% of the required original system, may be installed if the original system cannot absorb all the sewage. No division of the lot or erection of structures on the lot shall be made if such division or structure impairs the usefulness of the 100% expansion area.
- (h) No property shall be improved in excess of its capacity to treat and dispose of sewage effluent by the means provided in this Code.
- (i) No private sewage disposal system, or part thereof, shall be located in any lot other than the lot which is the site of the building or structure served by such system; nor shall any private sewage disposal system or part thereof, be located at any point having less than the minimum distances indicated in Table I-1.

Nothing in this Code shall be construed to prohibit the use of all or part of an abutting lot to provide additional space for a private sewage disposal system or part thereof, when proper cause, transfer of ownership, or change of boundary not in violation of other requirements has been first established to the satisfaction of the Administrative Authority. The instrument recording such action shall constitute an agreement with the Administrative Authority which shall clearly state and show that the areas so joined or used shall be maintained as a unit during the time they are so used. Such agreement shall be recorded in the office of the County Recorder as part of the conditions of ownership of said properties, and shall be binding on all heirs, successors, and assigns to such properties. A copy of the instrument recording such proceedings shall be filed with the Administrative Authority.

- (j) No building permit shall be issued until the Administrative Authority has approved the site for a private sewage disposal system.
- (k) Nothing contained in this appendix shall be construed to prevent the Administrative Authority from requiring compliance with statutes, ordinances, or rules having higher requirements than those contained herein, where such statutes, ordinances, or rules are essential to maintain a safe and sanitary condition.
- (1) Exception: The Administrative Authority may, at its discretion, approve an alternative private sewage treatment and disposal system.

I 2 Definitions

- (a) Administrative Authority – A municipality or county that enforces the state plumbing code. The director of the Arizona Department of Environmental Quality may delegate functions, powers, or duties to a municipality or county under A.R.S. § 49-107.
- (b) Aggregate – Clean graded hard rock or gravel. Aggregate shall have not more than 2% fines by weight. Aggregate shall be of uniform size, 3/4 inches (19.1 mm) to 2 1/2 inches (63.5 mm) in diameter, and shall offer 30% or more void space. The aggregate shall have a hardness value of three or greater on the Moh's Scale of Hardness (aggregate that can scratch a copper penny without leaving any residual rock material on the coin would be a hardness of three or more on the Moh's Scale of Hardness). Volcanic rock that meets the above criteria may be substituted for hard rock or gravel.
- (c) Bedroom – A habitable room providing privacy and used for sleeping purposes. For the purposes of this Code, a loft or a basement shall be considered a bedroom.
- (d) Disposal Area – Area within the horizontal plane that is delineated by a simple figure that encompasses the soil absorption components of a wastewater system.

- (e) Disposal Bed – A type of bottom area absorption system that uses an underground area up to 12 feet (3.7 m) wide, partially filled with aggregate. Piping distributes the effluent evenly throughout the entire bed.
- (f) Disposal Field (Drainfield) – An aggregate-filled bed or trench into which effluent is discharged for final treatment and disposal. A soil absorption system is constructed to permit the discharge of treated sewage effluent into native soil. Construction is performed following site-specific specifications including soil excavation and the installation of disposal piping, aggregate, and other specified components and materials. The plan view of a drainfield shows the disposal area. The soil absorption area of a drainfield is the total surface within a drainfield that is approved by the Administrative Authority for the discharge of treated sewage effluent into the native soil.
- (g) Disposal Pipe – Pipe that is placed in disposal trenches, beds, or a seepage pit to disperse effluent to the soil absorption surfaces.
- (h) Disposal Pit (Seepage Pit) – A type of sidewall absorption system that uses a vertical, cylindrical underground excavation constructed to permit disposal of effluent by soil absorption through the pit's walls.
- (i) Disposal Trench – A type of absorption trench that uses an area, excavated 1 foot (.3 m) to 3 feet (.9 m) wide, which contains aggregate and a single effluent disposal pipe.
- (j) Distribution Box – A watertight structure that receives and distributes effluent in equal portions to two or more pipes that convey effluent to disposal pipes.
- (k) Domestic Water Source Intake – A point of water intake or a suction pipeline located in any stream, lake, or reservoir that is used for the purpose of providing water for human consumption.
- (l) Dosing Tank – A watertight receptacle located between the treatment unit and the drainfield, equipped with a pump or siphon, that stores and delivers doses of treated sewage effluent to the drainfield.
- (m) Dry Wash – A watercourse that only flows in direct response to precipitation and whose channel at all times is above the water table.
- (n) Effective Absorption Area – Area of native soil that is approved by the Administrative Authority for the absorption of treated sewage effluent in a disposal trench, pit, or other approved drainfield.
- (o) Failure – The inability of any disposal system component to function as designed.
- (p) Five-Day Biochemical Oxygen Demand (BOD) – The quantity of oxygen used in the biochemical oxidation of organic matter in five days at 20 degrees Centigrade under specific conditions and reported as milligrams per liter (mg/l).
- (q) Groundwater – Water that is in the zone of saturation and under pressure equal to or greater than atmospheric pressure.
- (r) Impermeable layer – A soil zone with a percolation rate numerically greater than 120 minutes per inch or soils classified as impermeable (for example: clay or rock).
- (s) Live stream – A watercourse with perennial flow or where surface water is present at least 10% of the time during a calendar year, based upon historic flow or weather records.
- (t) Mottles – Soil color patterns caused by alternating saturated (anaerobic) and unsaturated (aerobic) soil conditions.
- (u) Percolation Test – An empirical test used to estimate the rate at which effluent is absorbed by the soil.
- (v) Repair – The extension, alteration, replacement, or relocation of existing components of a private sewage disposal system.
- (w) Rock – A body of consolidated or partially consolidated material, composed of minerals and located at or below the land surface. Rock includes bedrock (fractured or unfractured) and partially-weathered rock that is relatively hard and cannot be dug with a hand shovel.
- (x) Septage – All sludge, scum, liquid, or other material treated using a private sewage disposal system.
- (y) Site – The location of an existing or proposed private sewage disposal system.
- (z) Site Investigation – The practice of investigating, evaluating, and reporting on soil, topographic, and location conditions that affect the design and function of a private sewage disposal system.
- (aa) Soil Evaluation – The practice of investigating, characterizing, and reporting the properties of soil used to absorb treated sewage effluent in a zone of unsaturated flow.
- (ab) Soils – The naturally occurring, unconsolidated mineral and organic material on the land surface, developed from rock and other parent material that consists of sand, silt, and clay-sized particles and variable amounts of organic matter. In a zone of transition between two types of soil, the soil will be classified according to those soil characteristics that represent 51% or more of the total zone.
- (ac) Soil Profile – A vertical cross-section of the undisturbed soil showing the characteristic soil horizontal layers or soil horizons that have formed as a result of the combined effects of parent material, topography, climate, biological activity, and time.
- (ad) Total Suspended Solids (TSS) – Solids in wastewater that can readily be removed by standard filtering procedures in a laboratory and reported in milligrams per liter (mg/l).

I 3 Capacity of Septic Tanks

The design liquid capacity of all septic tanks shall conform to Table I-2 and I-3.

I 4 Area of Disposal Fields

The minimum effective absorption area in disposal fields and estimated waste/sewage flow rate shall conform to Tables I-3, I-4 (A), I-4 (B) and I-7 and shall be as follows:

- (1) When disposal fields are installed, a minimum of 150 square feet (13.9 sq. m) of trench bottom shall be provided for each system exclusive of any hard pan, rock, clay, or other impervious formations. Sidewall area in excess of the required 12 inches (30.5 cm) and not to exceed 36 inches (91.4 cm) below the disposal pipe may be added to the trench bottom area when computing absorption areas.
- (2) When leaching beds are installed in lieu of trenches, the area of each such bed shall be at least 50% greater than the tabular requirements for trenches. Perimeter sidewall area in excess of the required 12 inches (30.5 cm) and not to exceed 36 inches (91.4 cm) below the disposal pipe may be added to the trench bottom area when computing absorption areas.
- (3) No excavation for a disposal pipe or disposal bed shall extend within the system's specified minimum vertical separation in order to ensure the system does not contaminate the underlying groundwater in excess of Arizona Aquifer Water Quality standards.
- (4) When leaching chambers are installed in lieu of pipe and aggregate, an equivalent absorption area shall be provided based on the calculated effective chamber absorption area. The calculated effective chamber absorption area is the nominal open-bottom absorption area (length times width) times 1.43, plus the product of two times the vertical height of the sidewalls times the chamber length. The sidewall chamber shall provide a minimum of 35% open area for side wall credit to be allowed, and shall be constructed to minimize the movement of fines into the chamber area. The use of filter fabric or geotextile against sidewall openings is prohibited. The required

minimum absorption area shall be calculated using table I-4 (A), I-4 (B) or I-7.

Example:

The chamber to be used has an open bottom 3 feet wide, 6 feet long, and has 1 vertical foot (0.9 m, 1.8 m, and 0.3 m deep) of sidewall. The disposal system is for a 3-bedroom dwelling. The soil is loamy sand (N). Depth of chamber bottom is to be less than 5 feet (1.5 m) below the finished grade (the installation is considered a shallow system).

The calculated effective chamber absorption area per chamber is:

Chamber bottom area = 3 feet x 6 square feet (0.9 x 1.8 sq. m.) of open bottom area x 1.43 = 25.74 square feet (2.39 sq. m.), plus

Chamber sidewall = 2 sidewalls x 1 foot high x 6 feet long = 12 square feet (2 x 0.30 m. x 1.83 m. = 1.11 sq. m.).

The effective chamber absorption area = the chamber bottom plus sidewalls

Chamber sidewall = 25.74 square feet (2.39 sq. m.) + 12 square feet (1.11 sq. m.) = 37.74 square feet (3.5 sq. m.) per chamber.

The number of chambers needed is calculated as follows: Wastewater flow rate is three bedrooms x 150 gallons per day (568 lpd), or 450 gallons per day (1703 lpd). The soil application rate for loamy sand [Table I-4 (A), Question N, Column A] is listed as 0.80 gallons per day per square foot (32.6 lpd/sq. m.) Dividing the flow rate, 450 gallons per day (1703 lpd), by the soil application rate, 0.80 gpd/sq. ft. (32.6 lpd/sq. m) yields a total absorption area of 562.5 square feet (52.3 sq. m.). Since the effective chamber absorption area of each chamber is 37.74 square feet (3.5 sq. m.), a total of 14.9 chambers are needed.

Required area = 562.5 sq. ft. (52.3 sq. m.) divided by 37.74 sq. ft. (3.5 sq. m.).

Round up to a total chamber requirement of 15 chambers.

I 5 Area of Seepage Pits

The minimum effective absorption area in any seepage pit shall be predicated on estimated waste/sewage flow rates in Table I-3 and shall conform to Tables I-5 and I-6 as follows:

- (1) The minimum effective absorption area in any seepage pit shall be calculated as the excavated sidewall area below the inlet exclusive of any hardpan, rock, clay, or other impervious formations.
- (2) Seepage pit sizes may be computed from Table I-5 or using percolation tests prescribed in I 15.
- (3) The minimum required area of porous formation shall be provided in one or more seepage pits. No seepage pit excavation shall extend into the system's specified minimum vertical separation from the water table nor to a depth where sewage may contaminate the underlying groundwater that is protected by state law for domestic or drinking water purposes.
- (4) The applicant shall supply acceptable evidence of depth to groundwater to the Administrative Authority.
- (5) A boring log that describes soil from the seepage pit shall be submitted to the Administrative Authority.

I 6 Soil Testing

Seepage pit and disposal field sizes shall be computed from Tables I-4 (A), I-4 (B), I-5, I-6, and I-7.

I 7 Septic Tank Design and Construction

- (a) All septic tanks shall meet the specifications set forth in I 7, (b) through (q).

- (b) Septic tank designs shall produce a clarified effluent and shall provide adequate space for sludge and scum accumulations.
- (c) Septic tanks shall be constructed of solid durable materials, not subject to excessive corrosion or decay and shall be water-tight.
- (d) Septic tanks shall have a minimum of two compartments except when placed in series. The inlet compartment of any septic tank not placed in series shall be nominally 67 to 75% of the total required capacity of the tank. Septic tanks placed in series shall be considered as a unit and shall meet the same criteria as a single tank. The liquid depth of the septic tank shall not be less than 42 inches (1.07m). A septic tank of 1000 gallon capacity shall have a length of at least 8 feet (2.44m). For septic tanks of greater capacity, the tank length shall be at least two times but not more than three times the width.
- (e) Access to each septic tank interior shall be provided by at least two access openings 20 inches (50.8 cm) in minimum dimension. One access opening shall be located over the inlet and one access opening shall be located over the outlet. Whenever a first compartment exceeds 12 feet (3.7 m) in length, an additional access opening shall be provided over the baffle wall. Access openings and risers, if needed, shall be constructed to ensure accessibility within 6 inches (0.15 m) below grade. A permanent surface marker appropriate to the site shall be provided for locating the septic tank access openings for maintenance.
- (f) The inlet and outlet pipe openings shall be not less in size than the connecting sewer pipe. The vertical leg of a round inlet and outlet fittings shall not be less in size than the connecting sewer pipe nor less than 4 inches (10.1 cm). A baffle-type fitting shall have the equivalent cross-sectional area of the connecting sewer pipe and not less than a 4 inch (10.2 cm) horizontal dimension when measured at the inlet and outlet pipe inverts.
- (g) The inlet and outlet pipe or baffle shall extend 4 inches (10.2 cm) above and at least 12 inches (30.5 cm) below the water surface. The invert of the inlet pipe shall be at a level not less than 2 inches (5.1 cm) above the invert of the outlet pipe.
- (h) Inlet and outlet pipe fittings or baffles, and compartment partitions shall have a free vent area equal to the required cross-sectional area of the house sewer or private sewer discharging therein to provide free ventilation above the water surface from the disposal field or seepage pit through the septic tank, house sewer, and stack to the outer air.
- (i) The sidewalls shall extend at least 12 inches (30.5 cm) above the liquid depth. The cover of the septic tank shall be at least 2 inches (5.1 cm) above the top of the inlet fitting vent opening.
- (j) Partitions or baffles between compartments shall be of solid, durable material and shall extend at least 4 inches (10.1 cm) above the liquid level. The open area of the baffle shall be between one and two times the open area of the inlet pipe or for a horizontal slot, shall be no more than 6 inches in height, and shall be located at the midpoint of the liquid level of the baffle. Wooden baffles are prohibited.
- (k) Each tank shall be structurally designed to withstand all anticipated earth or other loads. All septic tank covers shall be capable of supporting an earth load of 300 pounds per square foot (14.4 kPa) for a minimum soil cover of 2 feet (0.61 m). When the top of the tank is greater than 2 feet (0.61 m) below finished grade, the septic tank and cover shall be capable of supporting an additional load of 150 pounds per square foot (7.2 kPa) for each additional foot of cover.
- (l) Septic tanks installed under concrete or black top paving shall have the required access openings extended to grade in a manner acceptable to the Administrative Authority.

- (m) The inlet and outlet ends of the tank shall be clearly and permanently marked on the outside of the tank with the terms "INLET" or "IN," and, "OUTLET" or "OUT," above, or to the right or left of the corresponding inlet and outlet openings.
- (n) It is permissible to have septic tanks placed in series to meet the minimum septic tank capacity requirements.
- (o) Materials
 - (1) Cast in Place Concrete Septic Tanks

All concrete septic tanks shall be protected from corrosion by coating with an approved bituminous coating by construction with a concrete mix incorporating 15% to 18% fly ash, or by other acceptable means. The coating shall extend to at least 4 inches (101.6 mm) below the water line, and shall cover all of the internal area above that point. Septic tanks constructed in place shall comply with the American Concrete Institute (ACI) standards 318-99, 318R-99, and 350R-89.
 - (2) Steel Septic Tanks

The minimum wall thickness of any steel septic tank shall be No. 12 U.S. gauge (0.109 cm) and each tank shall be protected from corrosion, both externally and internally, by an approved bituminous coating or by other acceptable means.
 - (3) Prefabricated septic tanks

Materials for precast concrete septic tanks shall comply with ASTM C1227-00. Materials for fiberglass or polyethylene septic tanks shall comply with IAPMO PS1-93. If any conflict exists between this appendix and ASTM C1227-00 or IAPMO PS1-93, the requirements of this appendix shall apply.
 - (4) Alternative materials

Septic tanks constructed of alternative materials may be approved by the Administrative Authority if they comply with approved, applicable standards in this Code.
 - (5) Prohibited Materials

Wooden, block, and bare steel septic tanks are prohibited.
- (p) All tanks shall be clearly and permanently marked with the manufacturer's name and registered trademark, the month and year of manufacture, the maximum recommended depth of earth cover in feet or meters and the design liquid capacity of the tank. The markings shall be adequately protected from corrosion so as to remain permanent and readable over the life of the tank.
- (q) A septic tank effluent filter approved by the Administrative Authority shall be installed on all new private sewage disposal systems. The filter shall prevent the passage of solids larger than 1/8 inch (3.2 mm) in diameter while under 2 feet (0.61 m) of hydrostatic head. The filter shall be constructed of materials that are resistant to corrosion and erosion and be of adequate size for the anticipated hydraulic and organic loading.

I 8 Disposal Fields

- (a) Distribution lines shall be constructed of clay tile laid with open joints, perforated clay pipe, perforated high density polyethylene pipe, perforated ABS pipe, perforated PVC pipe, or other approved materials, provided that sufficient openings are available for distribution of the effluent into the trench area.
- (b) Before placing aggregate or drain lines in a prepared excavation, all smeared or compacted surfaces shall be removed from trenches by raking to a depth of 1 inch (2.5 cm) and the loose material removed. Aggregate shall be placed in the trench to the depth and grade required by this section. Drainpipe shall be placed on aggregate in an approved manner. The drain lines shall then be covered with aggregate to the minimum depth required by this section and this covered with landscape filter fabric, geotextile, or similar porous material to prevent closure of voids with earth backfill. No earth backfill shall be placed over the aggregate cover until after inspection and acceptance.

Exception:

Listed or approved leaching chambers may be used in lieu of pipe and aggregate. Chamber installations shall follow this appendix for disposal fields, where applicable, and shall conform to manufacturer's installation instructions.
- (c) A grade board staked in the trench to the depth of aggregate shall be utilized when distribution line is constructed with drain tile or a flexible pipe material which will not maintain alignment without continuous support.
- (d) Where two or more drain lines are installed, an approved distribution box of sufficient size to receive all lateral lines and flows shall be installed at the head of each disposal field. The inverts of all outlets shall be level and the invert of the inlet shall be at least 1 inch (2.5 cm) above the outlets. Distribution boxes shall be designed to ensure equal flow and shall be installed on a stable level surface such as a concrete slab or natural or compacted soil. Concrete distribution boxes shall be protected from corrosion by coating with an appropriate bituminous coating, or constructed of concrete with a 15% to 18% fly ash content, or by other approved methods acceptable to the Administrative Authority.
- (e) All laterals from a distribution box to the disposal field shall be approved pipe with watertight joints. Multiple disposal field laterals, wherever practicable, shall be of uniform length.
- (f) Connections between a septic tank and a distribution box shall be laid with approved pipe with watertight joints on natural ground or compacted fill.
- (g) Disposal fields and beds shall be constructed as specified in Tables I-4 (A) and I-4 (B) and the following criteria:

Gravity Trenches	Minimum	Maximum
Number of trenches ¹	1	-
Length of trench	-	100 feet (30.5 m)
Bottom width of trench	12 inches (30.5 cm)	36 inches (91.4 cm)
Depth of cover over disposal pipe	9 inches (22.9 cm)	24 inches (61.0 cm) ²
Aggregate material under disposal pipe	12 inches (30.5 cm)	-
Aggregate material over disposal pipe	2 inches (5.1 cm)	2 inches (5.1 cm)
Slope of disposal pipe	level	level
Disposal pipe diameter	3 inches (7.6 cm)	4 inches (10.1 cm)
Spacing of disposal pipe, or leaching	2 x effective depth ³ or 5 feet (1.5 m) whichever is greater	

Notes:

¹ Two trenches are recommended.

² For more than 24 inches (61.0 cm), SDR 35 or equivalent strength pipe is required.

³ The distance between the bottom of the disposal pipe and the bottom of the trench bed.

Gravity Beds	Minimum	Maximum
Number of disposal pipes	2	-
Length of bed	-	100 feet (30.5 m)
Distance between disposal pipes	4 feet (1.2 m)	6 feet (1.8 m)
Width of bed	10 feet (3.0 m)	12 feet (3.66 m)
Distance from pipe to sidewall	3 feet (0.91 m)	3 feet (0.91 m)
Depth of cover over disposal pipe	9 inches (22.9 cm)	14 inches (35.6 cm)
Aggregate material under disposal pipe	12 inches (30.5 cm)	-
Aggregate material over disposal pipe	2 inches (5.1 cm)	2 inches (5.1 cm)
Slope of disposal pipe	level	level
Disposal pipe diameter	3 inches (7.6 cm)	4 inches (10.1 cm)

Disposal fields, trenches and leaching beds shall not be paved over or covered by concrete or any material that can reduce or inhibit any possible evaporation of sewer effluent.

- (h) When necessary on sloping ground to maintain a level disposal pipe, leach trenches or disposal beds shall be stepped. The lines between each horizontal leaching section shall be made with approved watertight joints and installed on natural or unfilled ground.

I 9 Seepage Pits

- (a) Seepage pits constructed in accordance with this appendix are considered a method of disposing of septic tank effluent. Criteria used for determining the suitability of a seepage pit are contained in table I 5. The capacity of seepage pits shall be based on the quantity of liquid waste discharging there into, and on the character and porosity of the surrounding soil and shall conform to Section I 5 of this appendix.
- (b) Multiple seepage pit installations shall be served through an approved distribution box or be connected in series by means of a watertight connection laid on undisturbed or compacted soil. The outlet from the pit shall have an approved sanitary tee with the vertical leg extending at least 12 inches (30.5 cm) below the inlet fitting.
- (c) Each seepage pit shall be circular in shape and shall have an excavated diameter of not less than 4 feet (1.2 m). Approval shall be obtained prior to construction for any pit having an excavated diameter greater than 6 feet (1.8 m).
- (d) For gravel filled seepage pits, the entire pit shall be backfilled with aggregate which shall be clean and of uniform gradation, 3/4 inch (1.9 cm) to 2 1/2 inches (6.4 cm) in diameter. Material used for backfill shall offer a minimum of 30% void space.

Each pit shall have a breather/effluent conductor pipe, which shall consist of a perforated pipe at least 4 inches (10.2 cm), in diameter, placed vertically within the backfill of the pit. The pipe shall extend from the bottom of the pit to 12 inches below ground level.

- (e) Lined, hollow pits shall be lined with concrete liner, or other approved materials and shall be laid on a firm foundation. Excavation voids behind the liner shall have a minimum of 9 inches (22.9 cm) of aggregate which shall be clean and of uniform gradation, 3/4 inch (1.9 cm) to 2 1/2 inches (6.4 cm) in diameter.
- (f) The cover of a lined seepage pit shall be constructed of an approved one- or two-piece reinforced concrete slab of 2500 pounds per square inch (17,238 kPa) minimum compressive strength, not less than 5 inches (127 mm) thick and designed to support an earth load of not less than 400 pounds per square foot (19.2 kPa). Each cover shall be provided with a 12 inch (30.5 cm) minimum access hole with plug or cover and shall be coated on the underside with an approved bituminous seal or constructed of concrete with 15% to 18% fly ash content or other nonpermeable protective material. Each cover shall have at least a 4 inch (10.2 cm) inspection pipe placed vertically not more than 6 inches below ground level.
- (g) The top of the seepage pit cover must be at least 18 inches (45.7 cm) but not more than 4 feet (1.2 m) below the surface of the ground.
- (h) An approved vented inlet fitting shall be provided in every seepage pit to prevent the inflow from damaging the sidewall. Exception: When using a one- or two-piece concrete slab cover inlet, the fitting may be a 1/4 bend fitting discharging through an opening in the top of the slab cover. For multiple

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seepage pit installations, the outlet fittings shall be per Section I 9 (b) of this appendix.

- (i) Seepage pit design details are shown in Figure I-1 and I-2.

I 10 Cesspools

The use of cesspools for waste disposal is prohibited.

I 11 Interceptor Design Criteria for Private Sewage Disposal Systems

- (a) When liquid wastes containing excessive amounts of grease, garbage, flammable wastes, sand, or other ingredients which may affect the operation of a private sewage disposal system, an interceptor for such wastes shall be installed.
- (b) Installation of such interceptors shall comply with Section 1008.0 of the Uniform Plumbing Code and their location shall be in accordance with Table I-1 of this appendix.
- (c) Sampling box shall be installed when required by the Administrative Authority.
- (d) Interceptors shall be of approved design and be of not less than two compartments. Structural requirements shall be in compliance with the applicable subparts of Section I 7 of this appendix.
- (e) Interceptors shall be located as close to the source as possible and be accessible for servicing. All necessary manholes for servicing shall be at grade level and be gas-tight.
- (f) Waste discharge from interceptors may be connected to a septic tank or other primary system or be disposed into a separate disposal system.
- (g) Recommended Design Criteria. Minimum design criteria for grease and garbage, commercial kitchens; sand-silt oil, auto washers; and silt-lint grease, laundries, and laundromats. (Formulae may be adapted to other types of occupancies with similar wastes or as determined by the Administrative Authority rules.)

Grease and Garbage, Commercial Kitchens						
Number of Meals per peak hour	x	Waste Flow Rate	x	Retention Time	x	Storage Factor = Interceptor Size (liquid capacity)

Sand-Silt Oil, Auto Washers						
Number of Vehicles per peak hour	x	Waste Flow Rate	x	Retention Time	x	Storage Factor = Interceptor Size (liquid capacity)

Silt-Lint Grease, Laundries, Laundromats						
Number of Machines	x	2 cycles per hour	x	Waste Flow Rate	x	Retention Time x Storage Factor = Interceptor Size (liquid capacity)

Waste Flow Rate

See Table I-3 of this appendix for estimated flow rates.

Estimated Retention Times	
Commercial kitchen waste: Dishwasher and/or disposal	2.5 hours
Single Service kitchen: Single serving with disposal	1.5 hours
Sand-silt-oil	2.0 hours
Lint-silt (laundry)	2.0 hours

Estimated Storage Factors		
Fully equipped commercial kitchen	8 hour operation:	1.0
	16 hour operation:	2.0
	24 hour operation	3.0
Single service kitchen		1.5
Auto washers	Self-serve	1.5
	Employee operated	2.0
Laundries, Laundromats	(allows for rock filter)	1.5

I 12 Inspection and Testing

- (a) Private sewage disposal systems shall be inspected and tested prior to operation.
- (b) Inspection shall be for the following purposes:
- (1) To verify soil characteristics used for the basis of the design.
 - (2) To verify the installation of approved equipment and materials.
 - (3) To verify that construction was performed in accordance with the permit.
 - (4) To verify watertightness of the septic tank and other components.
- (c) Field testing shall include:
- (1) Septic tank watertightness – Watertightness shall be established before inspection. A tank failing the watertightness test must be repaired or replaced, and cannot be

operated until it complies with watertightness requirements and has been inspected.

- (2) Water test procedures – Tanks shall be filled to the invert of the outlet. Water shall be left standing in the tank for at least 24 hours before the inspection. After 24 hours, refill the tank, if necessary. Concrete may absorb some water. At the start of the inspection, record the initial water level and time. After one hour, record the time and the corresponding water level. A tank shall pass a watertightness test if the water level dropped less than 1/4 of an inch. A visible leak (flowing water) shall be considered a failure. A damp or wet spot that is not flowing is not considered a failure.
- (3) Vacuum testing procedures – Vacuum testing may be used to determine watertightness in lieu of a water test. The tank shall be sealed and empty. A vacuum of 2 inches (5.1 cm) of mercury (1 psi or 69.1 gm/sq. cm) shall be applied and stabilized. The vacuum shall drop no more than 0.2 inches (0.5 cm) of mercury (0.1 psi or 6.9 gm/sq. cm) during the one hour test period.
- (4) A flow test shall be performed through the system to the point of effluent disposal. All lines and components shall be watertight. Capacities, required air space, and fittings shall be in accordance with the provisions set forth in this appendix.

I 13 Abandoned Sewers and Sewage Disposal Facilities

- (a) Every abandoned building (house) sewer, or part thereof, shall be plugged or capped in an approved manner within 5 feet (1.5 m) of the property line.
- (b) Every cesspool, septic tank, alternative sewage disposal system, and seepage pit which has been abandoned or has been discontinued otherwise from further use or to which no waste or soil pipe from a plumbing fixture is connected, shall have the sewage removed therefrom, shall have all electrical and mechanical components disconnected and abandoned under the appropriate procedures in the uniform building or electrical code, as applicable, and be completely filled with earth, sand, gravel, concrete, or other approved material.
- (c) The top cover or arch over the cesspool, septic tank, or seepage pit shall be removed before filling and the filling shall not extend above the top of the vertical portions of the sidewalls or above the level of any outlet pipe until inspection has been called and the cesspool, septic tank, or seepage pit has been inspected. After such inspection, the cesspool, septic tank, or seepage pit shall be filled to the level of the top of the ground.
- (d) No person owning or controlling any cesspool, septic tank, or seepage pit on the premises of such person or in that portion of any public street, alley, or other public property abutting such premises, shall fail, refuse, or neglect to comply with the provisions of this section or upon receipt of notice so to comply from the Administrative Authority.
- (e) Where disposal facilities are abandoned consequent to connecting any premises with the public sewer, the permittee making the connection shall fill all abandoned facilities as required by the Administrative Authority within 30 days from the time of connecting to the public sewer.

I 14 Drawings and Specifications

The Administrative Authority may require any or all of the following information before a permit is issued for a private sewage disposal system:

- (1) A site specific plot plan drawn to scale, dimensioned, showing direction and approximate slope of surface (2 foot (0.6 m) contour lines), location of all present or proposed retaining walls, drainage channels, water supply lines or wells, paved areas

and structures on the plot, number of bedrooms or plumbing fixtures in each structure and location of the private sewage disposal system with relation to lot lines and structures.

- (2) Details of construction including system profile and construction sections necessary to assure compliance with the requirements of this appendix together with a full description of the complete installation including specifications describing all materials, equipment, construction, workmanship, and methods of assembly and installation.
- (3) A log of the soil formations, percentage of rock, texture, structure, consistence, and mottles as provided in ASTM D-5921-96, or other practice acceptable, and depth to the groundwater below the land surface as determined by established records or test holes dug in close proximity to any proposed seepage pit or disposal field, together with a statement of water absorption characteristics of the soil at the proposed site as determined by site investigation and soil evaluation.

I 15 Percolation Testing, Soil Absorption Rate and Minimum vertical separation

- (a) The following procedures are to be used for determining the system soil absorption rate and minimum vertical separation:
 - (1) Establish the primary area based on site suitability review including proposed improvements.
 - (2) Establish the reserve area based on site suitability review and the type of system.
 - (3) Excavate the test hole to the depth necessary to confirm soil conditions for the design of the proposed disposal trench, bed or seepage pit. For disposal trenches and beds, a minimum of one test hole at both the primary disposal area and the reserve area is required. For seepage pits, one test hole is required at the primary disposal area.
 - (4) For disposal trenches and beds, testing shall be performed at appropriate locations and depths within the soil profile to determine the rate at which the soil will absorb effluent. Percolation tests should be performed at each obvious strata change that would significantly effect the design, soil application rate or minimum vertical separation.
 - (5) For seepage pits, discount the thickness of any relatively impermeable soil profiles while determining the soil absorption rate.
 - (6) A test hole shall not be excavated within 3 feet (0.9 m) of a ledge in an observation pit. Care should be taken to assure adjacent features impacting the absorption rate are avoided.
 - (7) The test report shall include a site evaluation map locating the test hole(s).
- (b) Disposal Trenches and Beds
 - (1) Area Preparation
 - (i) Dig a 12 inch square by 12 inches (30.5 cm x 30.5 cm) deep hole or a 15 inch round by 12 inches (38.1 cm x 30.5 cm) deep hole in undisturbed soil.
 - (ii) Scarify any smeared soil surfaces.
 - (iii) Remove loosened materials from the bottom of hole.
 - (2) Presoaking the Test Hole
 - (i) A system, such as a perforated bucket, can be used to support the sidewalls of the test hole if necessary. Fill any voids between the walls of the hole and the bucket with pea gravel.
 - (ii) Fill the test hole to 12 inches (30.5 m) above the bottom of the hole with clean water.
 - (iii) Observe the rate at which the water level drops in the hole and determine the time in minutes for the water to completely drain away.

- (iv) If the water drains away in less than 60 minutes, repeat the procedure. If the water drains away in less than an additional 60 minutes, repeat the procedure a third time.
- (v) Proceed immediately with testing if the water drains away three times in less than 60 minutes each time.
- (vi) If the water does not drain after the third refill, maintain the water level in the test hole at a minimum depth of 9 inches (22.9 cm) for at least four hours. Wait for a minimum of 16 hours and a maximum of 24 hours before proceeding with the test.
- (3) Conducting the Test
 - (i) Remove any materials that have sloughed into the test hole to be sure that the test hole has the dimensions indicated above.
 - (ii) Fill the hole with clean water to a depth of 6 inches (15.2 cm) above the bottom of the percolation test hole.
 - (iii) Measure the time it takes for the water level to drop exactly 1 inch (2.5 cm) from a fixed reference point. Record the drop in the water level. Care should be used to be sure that the measurement method does not have a significant impact on determination of the absorption rate.
 - (iv) Determine the stabilized absorption rate for the test hole. The approximate absorption rate can be determined by repetitively measuring the absorption rate until three consecutive values vary by no more than 10%. If three consecutive measurements indicate that the absorption rate is not approaching a steady rate or that the rate is close to a restrictive limit, an alternate method based on a graphical solution of the test data approximating the final stabilized rate is recommended.
 - (v) Record the test rate based on the above procedure.
- (c) Seepage Pits
 - (1) Area Preparation
 - (i) Drill a test hole at least 18 inches (45.7 cm) in diameter to the depth of the bottom of the proposed seepage pit. The minimum hole depth is 30 feet (9.1 m). After the test, the diameter of the test hole may be enlarged to allow construction of the seepage pit at the same location.
 - (ii) Scarify any smeared soil surfaces.
 - (iii) Remove loosened materials from the bottom of the hole.
 - (2) Presoaking the Test Hole
 - (i) Fill the bottom 6 inches (15.2 cm) of the test hole with gravel, if necessary, to prevent scouring.
 - (ii) Fill the test hole with clean water up to 3 feet (0.9 m) below grade.
 - (iii) Observe the rate at which the water level drops in the hole and determine the time in minutes for the water to completely drain away.
 - (iv) If the water drains away in less than four hours, repeat the procedure.
 - (v) Proceed immediately with testing if the water drains away in less than four hours after the second refill.
 - (vi) If the water does not drain within four hours after the second refill, refill the hole a third time and wait for a minimum of 16 hours and a maximum of 24 hours before proceeding with the test.
 - (vii) If there is still standing water in the hole after the presoaking has been completed, the water shall not be removed from the hole.
 - (3) Conducting the Test
 - (i) Fill the hole with clean water up to 3 feet (0.9 m) below grade.
 - (ii) Measure the decline of the water level from a fixed reference point every 10 minutes until a stabilized absorption rate is obtained.
 - (iii) Determine the stabilized absorption rate by repetitively measuring the absorption rate until three consecutive values vary by no more than 10%. If three consecutive measurements indicate that the absorption rate is not approaching a steady rate or that the rate is close to a restrictive limit, an alternate method based on a graphical solution of the test data approximating the final stabilized rate is recommended.
 - (iv) Do not use test results from any relatively impermeable soil profiles while determining the stabilized soil absorption rate.
 - (v) Record the rate based on the above procedure.

Table I-1. Location of Sewage Disposal System

Point of Beginning for Setback Distance	Minimum Horizontal Setback Distances in feet (meters)	
	Septic Tank	Disposal Trench/Bed or Seepage Pit
Buildings ¹	10 (3.0)	10 (3.0)
Property line adjoining private property	5 (1.5)	See footnote 2
Well (Public Water Supplies)	100 (30.5)	100 (30.5)
Wells (Private) ³	100 (30.5)	100 (30.5)
Live Streams ⁴	100 (30.5)	100 (30.5)
Lake or Reservoir ⁵	100 (30.5)	100 (30.5)
Domestic Water Source Intake	200 (61.0)	200 (61.0)
Dry Wash/Drainage Easement ⁶	50 (15.2)	50 (15.2)
Transmission Distribution Water Line	10 (3.0)	10 (3.0)
Domestic service Water Line ⁷	5 (1.5)	5 (1.5)

Cut on Sloping downgradient Terrain, Culverts and Roadway Ditches ⁸	15 (4.6)	15 (4.6) or 4 x the elevation difference between the finished grade at the point of beginning and the elevation at the cut bank bottom, ditch bottom, or culvert invert, whichever is greater, up to 50 feet (15.2 m)
Driveway ⁹	5 (1.5)	5 (1.5)
Swimming Pool ¹⁰	5 (1.5)	5 (1.5)
Any Easements (other than drainage easements) ¹¹	5 (1.5)	5 (1.5)

Notes:

- ¹ Including porches, decks and steps, whether covered or uncovered, breezeways, roofed patios, carports, covered walks, covered driveways, swimming pools, and similar structures and appurtenances.
- ² The setback requirement is 5 feet (1.5 m) unless the property is not served by a central system for the distribution of water and:
- (a) There is no existing or proposed individual well on adjoining private property, in which case the setback is 50 feet (15.2m); or
 - (b) A 100 foot (30.5m) separation distance cannot be maintained from an existing or proposed individual well, in which case the setback is the distance necessary to maintain the 100 foot (30.5m) separation; or
 - (c) The applicable setback requirement in (a) or (b) may be reduced to a minimum of 5 feet (1.5m) with a variance from the Administrative Authority.
- ³ For unaltered lots in a subdivision approved before October 1, 1986.
- ⁴ Measured from the nearest boundary of peak streamflow from a 10 year 24 hour precipitation event.
- ⁵ Measured from the elevation of high water line from a peak flow from a 10 year, 24 hour precipitation event at the spillway.
- ⁶ 50 foot (15.2 m) setback is measured from the edge of the defined natural channel bank of a drainage area of more than five acres or a drainage easement whichever is less. Setback may be reduced to 25 feet (7.6 m) up gradient from the system, if channel erosion protection is provided (naturally or man-made) and approved by the Administrative Authority.
- ⁷ Water pipes crossing or adjacent to sewer or drainage piping constructed of clay or materials that are not approved for use within a building shall be laid a minimum of 12 inches (30.5 cm) from the sewer or drain pipe.
- ⁸ Measure the setback from the outside of the private sewage disposal system component to the top of the cut bank or ditch, or to the nearest sidewall of a culvert.
- ⁹ Measured from the edge of the driveway to the nearest edge of septic tank excavation. A properly reinforced septic tank and cover may be placed at any location relative to a driveway if access openings, risers, and covers carry the design load and are protected from inflow.
- ¹⁰ Setback may be increased due to soil loading and stability concerns.
- ¹¹ 5 feet (1.5 m) minimum unless other setback requirements govern.

Table I-2. Design liquid capacity (size) of septic tanks

No. of Bedrooms	No. of Occupants	No. of Baths	Maximum Fixture Count	Recommended Septic Tank Size in Gallons (L)	Minimum Septic Tank Size in Gallons (L) (+ or – 5%)
2	4	1	12	1000 (3785)	1000 (3785)
2	4	2	18	1000 (3785)	1000 (3785)
3	6	1	18	1250 (4731)	1000 (3785)
3	6	2	18	1250 (4731)	1000 (3785)
4	8	2	24	1500 (5678)	1250 (4731)
4	8	3	25	1500 (5678)	1250 (4731)
5	10	2	30	2000 (7570)	1500 (5678)
5	10	3	30	2000 (7570)	1500 (5678)
5	10	4	32	2000 (7570)	1500 (5678)
6	12	3	36	2500 (9463)	2000 (7570)
6	12	4	36	2500 (9463)	2000 (7570)
6	12	5	39	2500 (9463)	2000 (7570)
7	14	3	42	2500 (9463)	2000 (7570)
7	14	4	42	2500 (9463)	2000 (7570)
7	14	5	42	2500 (9463)	2000 (7570)

Table I-3. Estimated Waste/Sewage Flow Rates

Because of the many variables encountered, it is not possible to set absolute values for waste/sewage flow rates for all situations. The designer should evaluate each situation and, if figures in this table need modification, they should be made with the concurrence of the Administrative Authority.

Type of Occupancy	Gallons (Liters) Per Day
1. Airports	15 (56.7) per employee 5 (18.9) per passenger
2. Auto Washers	Per manufacturer's specification
3. Bowling Alleys (snack bar only)	75 (283.9) per lane
4. Camps	
Campground with central comfort station	35 (132.4) per person
With flush toilets, no showers	25 (94.6) per person
Day camps (no meals served)	15 (56.7) per person
Summer and seasonal	50 (189.2) per person
5. Churches (Sanctuary)	5 (18.9) per seat
With kitchen waste	7 (26.4) per seat
6. Dance halls	5 (18.9) per person
7. Factories	
No showers	25 (94.6) per employee
With showers	35 (132.4) per employee
Cafeteria, add	5 (18.9) per employee
8. Hospitals	250 (946.3) per bed
Kitchen waste only	25 (94.6) per bed
Laundry waste only	40 (151.4) per bed
9. Hotels	
With kitchen	60 (227.1) per bed (2 person)
Without kitchen	50 (189.2) per bed (2 person)
10. Institutions (Resident)	75 (283.9) per person
Nursing home	125 (473.1) per person
Rest home	125 (473.1) per person
11. Laundries, self service (minimum 10 hours per day)	50 (189.2) per wash cycle
Commercial	Per manufacturer's specification
12. Motel	
With kitchen	60 (227.1) per bed (2 person)
Without kitchen	50 (189.2) per bed (2 person)
13. Offices	20 (75.7) per employee
14. Parks	
Mobile homes	250 (946.3) per parking space
Picnic parks (toilets only)	20 (75.7) per parking space
Recreational vehicles –	
Without water or sewer hook-up	75 (283.9) per parking space
With water and sewer hook-up	100 (378.5) per parking space
15. Restaurants – cafeterias	20 (75.7) per employee
Toilet	7 (26.4) per customer
Kitchen waste	6 (22.7) per meal
Garbage disposal	1 (3.7) per meal
Cocktail lounge	2 (7.5) per customer
Kitchen waste –	
Disposal service	2 (7.5) per meal
16. Schools – Staff and office	20 (75.7) per person
Elementary	15 (56.7) per student
Middle and high	20 (75.7) per student
With gym and showers, add	5 (18.9) per student
With cafeteria, add	3 (11.3) per student
Boarding, total waste	100 (378.5) per person
17. Service station, toilets	1000 (3785.4) for first bay 500 (1892.7) for each additional bay

18. Stores Public restrooms, add	20 (75.7) per employee 1 per 10 sq. ft. of floor space (3.79 per 9290.3 sq. cm of floor space)
19. Swimming pools, public	10 (37.8) per person
20. Theaters, auditoriums Indoor Drive-in	5 (18.9) per seat 10 (37.8) per space
21. Single Family Residential Dwellings	150 (567.7) per bedroom or 25 (94.6) per fixture unit whichever is greater
22. For structures and facilities not specifically addressed in the above table, flow rates available from other standard books and literature may be approved.	

- (a) Recommended Design Criteria. The size of the sewage disposal system components, for uses other than a single family residential dwelling, is calculated as follows:
For waste/sewage flow, up to 3000 gallons/day (11,355 liters/day)
Design Flow = The total of the estimated flow rates from Table I-3
Septic tank size = design flow x 2.1.
- (b) Also see Section I 3 of this appendix.
- (c) Additional treatment of sewage is required if sewage quality exceeds 430 milligrams/liter for total suspended solids, 380 milligrams/liter for the five-day biochemical oxygen demand, 75 milligrams/liter for fats, oils, and greases, or the sewage includes wastes other than those originating from domestic toilet flushing, food preparation, non-occupational laundry, or personal hygiene, or wastes originating from an operation using any hazardous substance or creating a hazardous waste as defined in the statutes or rules of the Arizona Department of Environmental Quality.

Table I-4 (A). Soil Absorption Rate and Minimum Vertical Separation for Shallow Disposal Field Systems by Soil Evaluation Method¹

Instructions: Read questions in the following table beginning with row A. The first "yes" response from columns a or b determines the maximum soil absorption rate.

	A Soil Absorption Rate in gallons per day (gpd) per sq. ft. [liters per day (lpd) sq. m]	B Soil Absorption Rate in sq. ft. per 100 gallons per day (gpd) [sq. m. per 100 liters per day (lpd)]
A. Is the horizon gravelly coarse sand or coarser?	0 (0)	0 (0)
B. Is the structure of the horizon moderate or strongly platy?	0 (0)	0 (0)
C. Is the texture of the horizon sandy clay loam, clay loam, silty clay loam, or finer and structure weak platy?	0 (0)	0 (0)
D. Is the moist consistence stronger than firm or any cemented class?	0 (0)	0 (0)
E. Is texture sandy clay, clay, or silty clay of high clay content and structure massive or weak?	0 (0)	0 (0)
F. Is texture sandy clay loam, clay loam, silty clay loam, or silty loam and structure massive?	0 (0)	0 (0)
G. Is the texture of the horizon loam or sandy loam and the soil structure massive?	.20 (8.15)	500 (12.3)
H. Is texture sandy clay, clay, or silty clay of low clay content and the structure moderate or strong?	.20 (8.15)	500 (12.3)
I. Is texture sandy clay loam, clay loam, or silty clay loam and structure weak?	.20 (8.15)	500 (12.3)
J. Is texture sandy clay loam, clay loam, or silty clay loam and structure moderate or strong?	.40 (16.30)	250 (6.1)
K. Is texture sandy loam, loam, or silty loam and structure weak?	.40 (16.30)	250 (6.1)
L. Is texture sandy loam, loam, silt loam and structure moderate or strong?	.60 (24.45)	166.7 (4.1)

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M. Is texture fine sand, very fine sand, loamy fine sand, or loamy very fine sand?	.40 (16.30)	250 (6.1)
N. Is texture loamy sand or sand?	.80 (32.59)	125 (3.1)
O. Is texture coarse sand? ²	1.20 (48.89)	83.3 (2.0)

Notes:

¹ Shallow trench and bed systems are less than 5 feet (1.52 m) deep and shall have a minimum vertical separation of 4 feet (1.22 m) to rock, fractured rock, soils with greater than 50% rock fragments and a 5 foot (1.52 m) zone of unsaturated soil to groundwater.

² Shallow trench and bed systems are less than 5 feet (1.52 m) deep and shall have a minimum vertical separation of 10 feet (3.04 m) to rock, fractured rock, soils with greater than 50% rock fragments and a 10 foot (3.04 m) zone of unsaturated soil to groundwater.

Example:

Three-bedroom dwelling, wastewater flow rate = 450 gpd (1,703 lpd), soil texture is loamy sand (N).

Using Column A – Effective Area = Divide the flow rate (450 gpd) (1,703 lpd) by the soil application rate of 0.8 gpd/sq. ft. (32.6 lpd/sq. m.)

Effective Area = 450/0.8 = 562.5 sq. ft. (1,703/32.6 = 52.3 sq. m.).

Using Column B – Effective Area = Multiply the flow rate (450 gpd) (1,703 lpd) by the soil application rate of 125 sq. ft./100 gpd (3.1 sq. m./100 lpd)

Effective Area = 450x125/100 = 562.5 sq. ft. (3.1 x 1,703/100 = 52.3 sq. m.).

Table I-4 (B). Soil Absorption Rate and Minimum Vertical Separation for Deep Disposal Field Systems by Soil Evaluation Method ¹

Instructions: Read questions in the following table beginning with row A. The first “yes” response from columns A or B determines the maximum soil absorption rate.

	A Soil Absorption Rate in gallons per day (gpd) per sq. ft. [liters per day (lpd) sq. m]	B Soil Absorption Rate in sq. ft. per 100 gallons per day (gpd) [sq. m. per 100 liters per day (lpd)]
A. Is the horizon gravelly coarse sand or coarser?	0 (0)	0 (0)
B. Is the structure of the horizon moderate or strongly platy?	0 (0)	0 (0)
C. Is the texture of the horizon sandy clay loam, clay loam, silty clay loam, or finer and structure weak platy?	0 (0)	0 (0)
D. Is the moist consistence stronger than firm or any cemented class?	0 (0)	0 (0)
E. Is texture sandy clay, clay, or silty clay of high clay content and structure massive or weak?	0 (0)	0 (0)
F. Is texture sandy clay loam, clay loam, silty clay loam, or silty loam and structure massive?	0 (0)	0 (0)
G. Is the texture of the horizon loam or sandy loam and the soil structure massive?	.13 (5.3)	769 (18.9)
H. Is texture sandy clay, clay, or silty clay of low clay content and the structure moderate or strong?	.13 (5.3)	769 (18.9)
I. Is texture sandy clay loam, clay loam, or silty clay loam and structure weak?	.13 (5.3)	769 (18.9)
J. Is texture sandy clay loam, clay loam, or silty clay loam and structure moderate or strong?	.27 (11.0)	370.4 (9.1)
K. Is texture sandy loam, loam, or silty loam and structure weak?	.27 (11.0)	370.4 (9.1)
L. Is texture sandy loam, loam, silt loam and structure moderate or strong?	.40 (16.3)	250 (6.1)
M. Is texture fine sand, very fine sand, loamy fine sand, or loamy very fine sand?	.27 (11.0)	370.4 (9.1)
N. Is texture loamy sand or sand?	.53 (21.6)	188.7 (4.6)
O. Is texture coarse sand?	0 (0)	0 (0)

Notes:

- ¹ Deep trench systems are greater than or equal to 5 feet (1.52 m) and less than 10 feet (3.0 m) deep and shall have a minimum vertical separation of 5 feet (1.52 m) to rock, fractured rock, soils with greater than 50% rock fragments and a 5 foot (1.52 m) zone of unsaturated soil to groundwater.

Example:

Three-bedroom dwelling, wastewater flow rate = 450 gpd (1,703 lpd), soil texture is loamy sand (N).

Using Column A – Effective Area = Divide the flow rate (450 gpd) (1,703 lpd) by the soil application rate of 0.53 gpd/sq. ft.(21.6 lpd)

Effective Area = $450/0.53 = 849$ sq. ft. ($1,703/21.6 = 78.8$ sq. m.).

Using Column B – Effective Area = Multiply the flow rate (450 gpd) (1,703 lpd) by the soil application rate of 188.7 sq. ft./100 gpd(4.6 sq. m./100 lpd)

Effective Area = $450 \times 188.7/100 = 849$ sq. ft. ($4.6 \times 1,703/100 = 78.3$ sq. m.).

Table I-5. Soil Absorption Rate and Minimum Vertical Separation for Seepage Pits

Soil Characteristics	Percolation Test Rate Range	Maximum Soil Absorption Rate	Minimum Vertical Separation to Groundwater	
			Gravel Seepage Pit	Lined Seepage Pit
	minutes per inch (minutes per cm)	gpd/sq. ft. (lpd/sq. m.)	ft (m)	ft (m)
Gravelly Coarse Sands	less than 1.00 (0.39)	greater than 1.20 (48.9) NOT PERMITTED	-	-
Coarse to Medium to Fine Sands	1.00 to less than 2.00 (0.39 to less than 0.78)	1.20 (48.9)	60 (18.3)	60 (18.3)
Medium to Fine Sands and Silty Sands	2.00 to less than 3.00 (0.78 to less than 1.18)	1.10 (44.8)	60 (18.3)	60 (18.3)
		1.00 (40.7)	60 (18.3)	60 (18.3)
	3.00 to less than 4.00 (1.18 to less than 1.57)	0.90 (36.7)	60 (18.3)	60 (18.3)
	4.00 to less than 5.00 (1.57 to less than 1.96)	0.75 (30.6)	60 (18.3)	60 (18.3)
	5.00 to less than 6.00 (1.96 to less than 2.75)			
Fine to Very Fine sands and Loamy Sands	7.00 to less than 10.00 (2.75 to less than 3.93)	0.63 (25.7)	25 (7.6)	25 (7.6)
Sandy to Silty Loams, loam	10.00 to less than 15.00 (25.4 to less than 38.1)	0.50 (20.4)	25 (7.6)	25 (7.6)
		0.44 (17.9)	25 (7.6)	25 (7.6)
	15.00 to less than 20.00 (38.1 to less than 50.8)	0.40 (16.3)	25 (7.6)	25 (7.6)
		0.36 (14.7)	25 (7.6)	25 (7.6)
	20.00 to less than 25.00 (50.8 to less than 63.5)			
	25.00 to less than 30.00 (63.5 to less than 76.2)			
Strongly Structured Loams and Clayey Soils	greater than 30.00 (76.2)	less than .36 NOT PERMITTED	-	-

- (a) Seepage pits shall be bored 5 feet (1.5 m) deeper than the proposed pit depth to verify underlying soil characteristics, unless water table evidence or bedrock is encountered sooner. The 5 feet (1.5 m) of overdrill shall then be backfilled with low permeability drill cuttings or other suitable material.
- (b) Seepage pits that terminate in gravelly, coarse sand stratas shall be backfilled 5 feet (1.5 m) above the beginning of such strata with low permeability drill cuttings or other suitable material.

Table I-6. Seepage Pit Effective Absorption Area

Effective Strata Depth Below Flow Line	Seepage Pit Effective Absorption Area, sq. ft. (sq. m.)		
	Diameter of Seepage Pit		
ft (m)	4 ft (1.2 m)	5 ft (1.5 m)	6 ft (1.8 m)
1 (0.3)	13 (1.2)	16 (1.5)	19 (1.8)
2 (0.6)	25 (2.3)	31 (2.9)	38 (3.5)
3 (0.9)	38 (3.5)	47 (4.4)	57 (5.3)
4 (1.2)	50 (4.6)	63 (5.9)	75 (7.0)
5 (1.5)	63 (5.9)	79 (7.3)	94 (8.7)
6 (1.8)	75 (7.0)	94 (8.7)	113 (10.5)
7 (2.1)	88 (8.2)	110 (10.2)	132 (12.3)
8 (2.4)	100 (9.3)	126 (11.7)	151 (14.0)
9 (2.7)	113 (10.5)	141 (13.1)	170 (15.8)
10 (3.0)	126 (11.7)	157 (14.6)	189 (17.6)
20 (6.1)	251 (23.3)	314 (29.2)	377 (35.0)
30 (9.1)	377 (35.0)	471 (43.8)	566 (52.6)
40 (12.2)	502 (46.6)	628 (58.3)	754 (70.0)
50 (15.2)	628 (58.3)	785 (72.9)	943 (87.6)

- (a) Minimum Effective Depth of Pit = 10 ft. (3.0 m).
 (b) Sufficient area shall be provided for at least two bedrooms.
 (c) Effective absorption surface for seepage pits includes sidewall areas only.

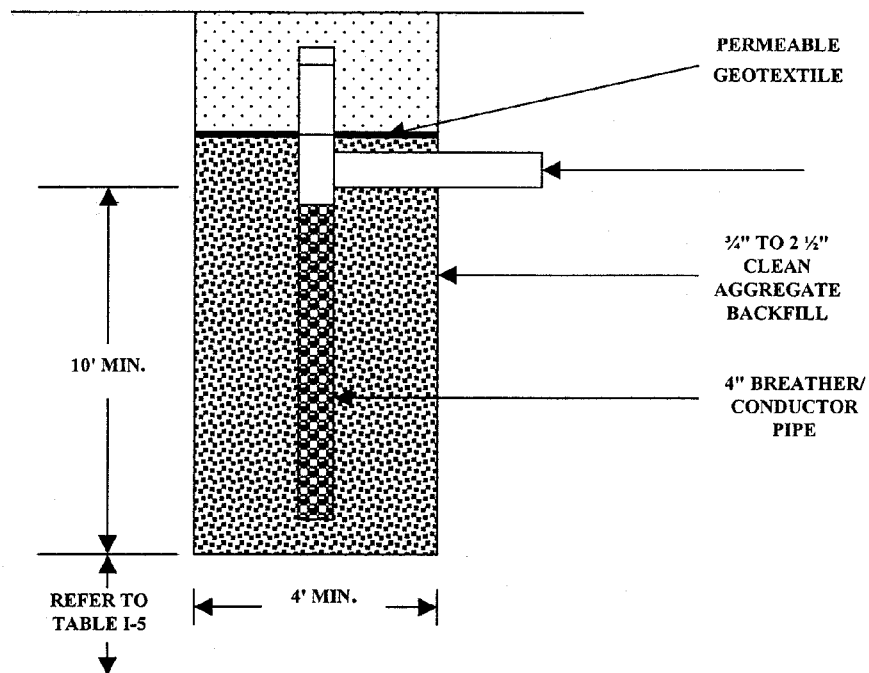
Table I-7. Soil Absorption Rate and Minimum Vertical Separation for Disposal Field Systems by Percolation Test Results

Percolation Rate from Percolation Test minutes per in (minutes per cm.)	Shallow Disposal Field System ² Soil Absorption Rate gpd/sq. ft. (lpd/sq. m.)	Deep Disposal Field System ³ Soil Absorption Rate gpd/sq. ft. (lpd/sq. m.)	Minimum Vertical Separation ⁴ ft (m)
less than 1.00	Note ¹	Note ¹	Note ¹
1.00 to less than 3.00 (1.18)	1.20 (48.9)	0.93 (37.9)	40.0 (12.2)
3.00 (1.18)	1.10 (44.8)	0.73 (29.7)	10.0 (3.0)
4.00 (1.57)	1.00 (40.7)	0.67 (27.3)	10.0 (3.0)
5.00 (1.97)	0.90 (36.7)	0.60 (24.4)	10.0 (3.0)
7.00 (2.76)	0.75 (30.6)	0.50 (20.4)	10.0 (3.0)
10.0 (3.94)	0.63 (25.7)	0.42 (17.1)	10.0 (3.0)
15.0 (5.91)	0.50 (20.4)	0.33 (13.4)	5.0 (1.5)
20.0 (7.87)	0.44 (17.9)	0.29 (11.8)	5.0 (1.5)
25.0 (9.84)	0.40 (16.3)	0.27 (11.0)	5.0 (1.5)
30.0 (11.81)	0.36 (14.7)	0.24 (9.8)	5.0 (1.5)
35.0 (13.78)	0.33 (13.4)	0.22 (9.0)	5.0 (1.5)
40.0 (15.75)	0.31 (12.6)	0.21 (8.6)	5.0 (1.5)
45.0 (17.72)	0.29 (11.8)	0.20 (8.1)	5.0 (1.5)
50.0 (19.68)	0.28 (11.4)	0.19 (7.7)	5.0 (1.5)
55.0 (21.65)	0.27 (11.0)	0.18 (7.3)	5.0 (1.5)
more than 55.0 to 60.0 (21.65 to 23.62)	0.25 (10.2)	0.17 (6.9)	5.0 (1.5)
more than 60.0 to 120 (23.62 to 47.24)	0.20 (8.1)	0.13 (5.3)	5.0 (1.5)

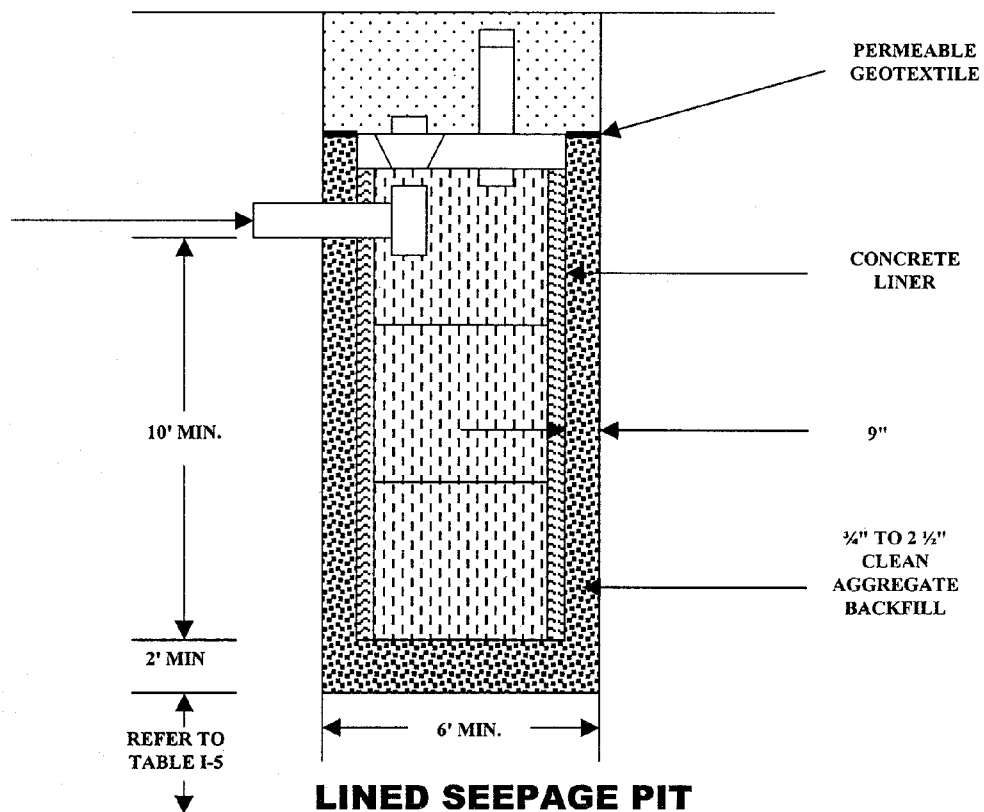
Notes:

¹ Not permitted for septic tank effluent.² Depth of bottom of disposal field below finished grade of soil is less than 5.00 feet (1.5 m).³ Depth of bottom of disposal field below finished grade of soil is 5.00 feet (1.5 m) or greater.⁴ Minimum vertical distance required for achieving unsaturated flow is measured from the bottom of a constructed disposal field to the nearest restrictive soil condition including, but not limited to, the seasonal high water table capillary fringe, impermeable layer, rock, fractured rock, soils with greater than 50% rock fragments, and unacceptable soil.

SEEPAGE PIT DESIGN



GRAVEL FILLED SEEPAGE PIT



LINED SEEPAGE PIT

FIGURE I-1

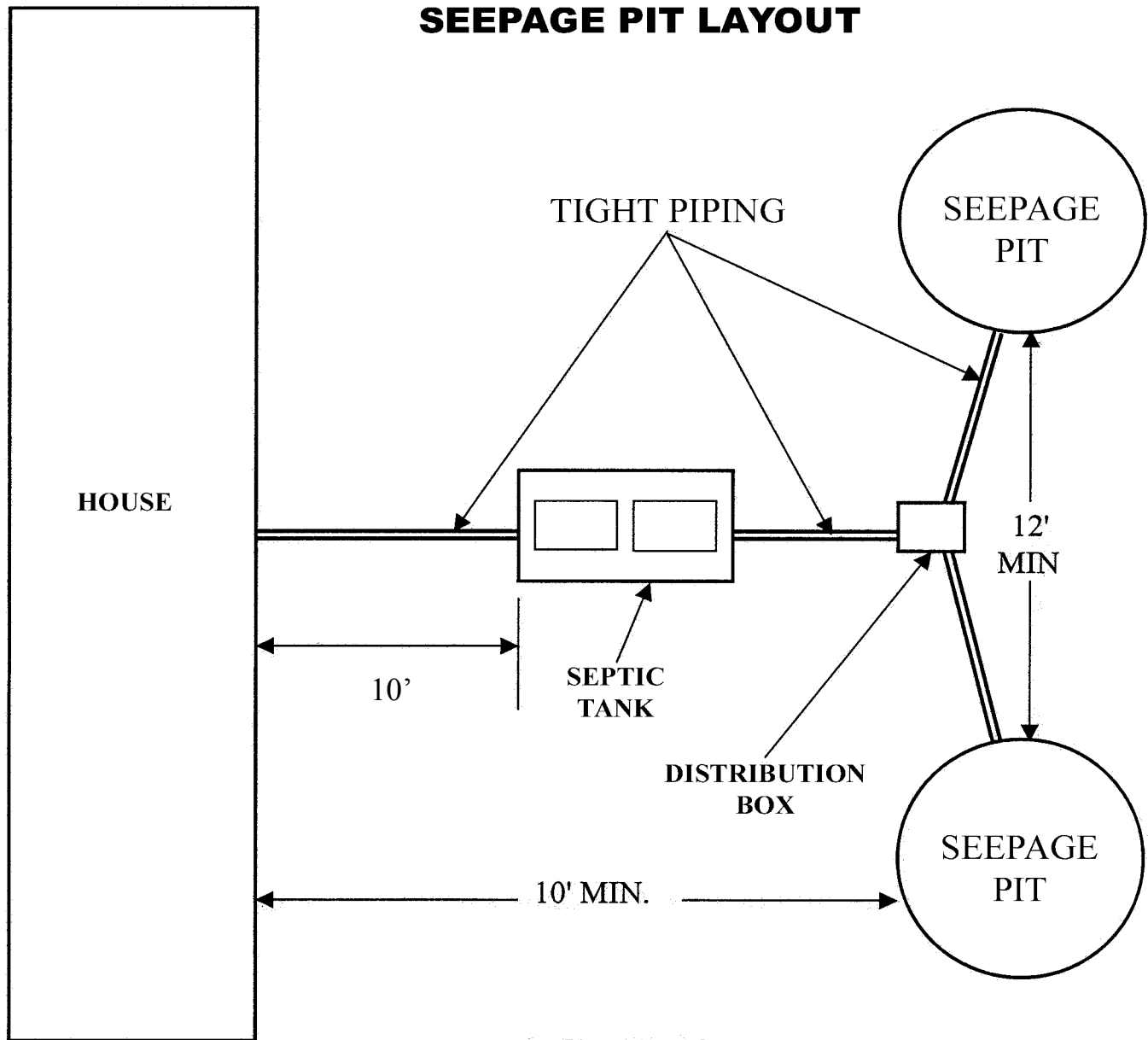


FIGURE I-2

Historical Note

New Appendix adopted by final rulemaking at 7 A.A.R. 1458, effective March 16, 2001 (Supp. 01-1). Table I-3 amended to correct typographical errors (Supp. 03-2).

R4-48-128. Appendix J, Reclaimed Water Systems

- A. Appendix J of the International Association of Plumbing and Mechanical Officials' (I.A.P.M.O.) Uniform Plumbing Code (1994 Edition) is incorporated by reference. This incorporation by reference does not include any later amendments or editions. Copies of the incorporated material are available from I.A.P.M.O. at 20001 Walnut Drive South, Walnut, CA, 91789-2825 and are on file with the Arizona Uniform Plumbing Code Commission and the Office of the Secretary of State.
- B. Appendix J, incorporated by subsection (A) is modified as follows:
 1. Appendix J2, paragraph 1, is modified to read: "Reclaimed water is water approved for specific uses after the water has been treated or processed by a wastewater treatment plant operated pursuant to statutes and rules of the Arizona

Department of Environmental Quality. The level of treatment and quality of the reclaimed water for the uses specified in this appendix are established by the Arizona Department of Environmental Quality pursuant to Arizona Administrative Code R18-9-703."

2. Appendix J2, paragraph 2, is deleted.

Historical Note

New Section adopted by final rulemaking at 5 A.A.R. 4309, effective October 18, 1999 (Supp. 99-4).

R4-48-129. Installation Standard for Non-metallic Building Sewers

This standard has no modifications.

Historical Note

New Section made by final rulemaking at 7 A.A.R. 4329, effective September 9, 2001 (Supp. 01-3). Section heading amended by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-130. Installation Standard for Tile-lined Roman Bath-tubs

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-131. Installation Standard for Copper Plumbing Tube, Pipe, and Fittings

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-132. Installation Standard for Tile-lined Shower Receptors (and Replacements)

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-133. Installation Standard for ABS Building Drain, Waste, and Vent Pipe and Fittings

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-134. Installation Standard for Hubless Cast Iron Sanitary and Rainwater Systems

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-135. Installation Standard for Polyethylene (PE) Cold Water Building Supply

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-136. Installation Standard for PVC Cold Water Building Supply and Yard Piping

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-137. Installation Standard for PVC Building Drain, Waste and Vent Pipe and Fittings

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-138. Installation Standard for Poly (Vinyl Chloride) (PVC) Natural Gas Yard Piping

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-139. Installation Standard for ABS Sewer Pipe and Fittings

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-140. Installation Standard for Polyethylene (PE) for Gas Yard Piping

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-141. Installation Standard for Protectively Coated Pipe

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-142. Installation Standard for Asbestos Cement Pressure Pipe for Water Service and Yard Piping

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-143. Installation Standard for Low Pressure Air Test for Building Sewers

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-144. Installation Standard for Extra Strength Vitrified Clay Pipe in Building Drains

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-145. Installation Standard for CPVC Solvent Cemented Hot and Cold Water Distribution Systems

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

1. IS 20-93, Sec. 301.1.2.3.2 Color, is modified to read:
Color. Solvent cements requiring the use of a primer, shall be colored orange. Solvent cements that do not require the use of a primer shall be colored yellow.
2. IS 20-93, Sec. 316.1.2 Procedures, steps 5 through 7 are modified to read:
Step 5. Apply CPVC primer (see Section 316.1.1.1) to inside of fitting socket. Take care to avoid puddling.
Note: If listed, single-step cement is utilized, this step may be eliminated.
Step 6. Apply CPVC primer to outside surface of pipe to depth of fitting socket.
Note: If listed, single-step cement is utilized, this step may be eliminated.
Step 7. Wait until primer surface is tacky. DO NOT attempt to soften (dissolve) the surface as is required for PVC.

Note: If listed, single-step cement is utilized, this step may be eliminated.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-146. Installation Standard for Welded Copper and Copper Alloy Water Tube

This installation standard has no modifications.

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).

R4-48-147. Installation Standard for PEX-AL-PEX and PE-AL-PE

The Uniform Plumbing Code incorporated in R4-48-102(A) is modified as follows:

Add a new installation standard for PEX-AL-PEX and PE-AL-PE:

COMPOSITE PEX-AL-PEX HOT AND PE-AL-PE COLD WATER-DISTRIBUTION SYSTEMS

This Standard shall govern the installation of composite piping in potable hot and cold water distribution systems within and under buildings and shall apply only to PEX-AL-PEX and PE-AL-PE piping meeting the requirements of ASTM F 1281-02e1 and ASTM F 1282-02e1. Installation, materials, and inspection shall comply with the 1994 edition of the Uniform Plumbing Code as modified by this Chapter, published by the International Association of Plumbing and Mechanical Officials, and shall also comply with this standard and manufacturer's installation recommendations.

NOTE: The following sections of the Uniform Plumbing Code shall apply to composite PEX-AL-PEX and PE-AL-PE piping.

- 301.0 Materials – Standards and Alternates
- 310.0 Workmanship
- 313.0 Protection of Piping, Materials, and Structures
- 314.0 Hangers and Supports
- 316.1.4 Flexible Compression Factory Fabricated Joints
- 316.2.3 Plastic Pipe to Other Materials
- 606.0 Joints and Connections
- 608.0 Water Pressure, Pressure Regulators, and Pressure Relief Valves
- 609.0 Installation, Unions, and Location
- 610.0 Size of Potable Water Piping

Note: The following clauses are the Installation Standard. Note that the Section numbers 301, 313, 314, 316, 606, 608, 609, and 610 relate to the sections of the UPC but the specific clause numbers of this Installation Standard are not intended to match the UPC.

Chapter 2 DEFINITIONS

ASTM American Society for Testing and Materials
IAPMO International Association of Plumbing and Mechanical Officials

PEX-AL-PEX Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene

PE-AL-PE Polyethylene-Aluminum-Polyethylene

UPC Uniform Plumbing Code as published by IAPMO

301.0 Materials – Standards and Alternates

301.1 Minimum Standards

301.1.1 Materials – Materials shall comply with the following requirements:

Materials	ASTM Standard
Crosslinked Polyethylene-Aluminum-Crosslinked Polyethylene (PEX-AL-PEX)	F 1281-02e1

Polyethylene-Aluminum-Polyethylene (PE-AL-PE) F 1282-02e1

Metal Insert Fittings for PEX-AL-PEX and PE-AL-PE

composite pipe F 1974-01e1

301.1.1.1 Piping – PEX-AL-PEX composite pipe shall comply with ASTM F 1281-02e1.

PE-AL-PE composite pipe shall comply with ASTM F 1282-02e1.

301.1.1.2 Fittings – Fittings shall be metal insert type and shall comply with ASTM F 1974-01e1.

Manufacturers of fittings shall recommend assembly procedures. Fittings are limited to the following types:

- (a) Insert fittings or compression type fittings,
- (b) Special listed fittings of other types - Connections to galvanized pipe or fittings shall be specifically designed for that purpose.

301.1.2 Markings

301.1.2.1 Piping – Composite piping shall be legibly marked at intervals of not more than 5' (1.5m) with at least the following:

- (a) Manufacturer's name or trademark;
- (b) ASTM F 1281-02e1(PEX-AL-PEX) or F 1282-02e1(PE-AL-PE);
- (c) Piping size;
- (d) Material type – PEX-AL-PEX or PE-AL-PE;
- (e) Pressure ratings at 125 psi (862 kPa) at 180° F (82° C) (PEX-AL-PEX)* or, 200psi (1380 kPa) at 73° F (23° C) (PE-AL-PE)*
- (f) Mark of an acceptable certification agency;
- (g) Manufacturer's date and material code

* The elevated temperature and pressure ratings for PEX-AL-PEX and PE-AL-PE in accordance with ASTM F1281-02e1 and ASTM F1282-02e1 are:

PEX-AL-PEX (orange colored)	200 psi at 73° F	125 psi at 180° F
PE-AL-PE (blue colored)	200 psi at 73° F	160 psi at 140° F

301.1.2.2 Fittings – Fittings shall be marked with at least the following:

- (a) Manufacturer's name or trademark or other acceptable markings; and
- (b) Fittings shall be labeled with the mark of an acceptable certification agency.
- (c) If size permits, ASTM F1974-01e1.

301.1.2.3 Position of Markings – When practical, markings shall be visible for inspection. Markings shall be visible prior to installation.

313.0 Protection of Piping, Materials, and Structures

313.1 Abrasion – Piping passing through metallic studs, joists, or hollow masonry walls shall be protected from abrasion or sharp edges by elastomeric or plastic sleeves, grommets, conical shaped punch holes or other approved means.

313.2 Puncture – Steel plate protection, minimum 18 gauge, shall be installed when the piping is within 1" (25 mm) of the nailing surface.

313.3 Exposed Piping

313.3.1 General – Where exposed piping may be subjected to mechanical damage it shall be protected.

313.4 Freezing – In areas where the system must be drained to

protect the system from freezing, horizontal lines shall be graded to drain.

- 313.5 Storage – Piping shall be stored in a way to protect the system from mechanical damage (slitting, puncturing, etc.). Piping should be stored undercover to keep it clean and avoid long term exposure to sunlight. Consult piping manufacturer for recommended limits for outside storage.

313.6 Thermal Expansion

313.6.1 General – The linear expansion rate for PEX-AL-PEX and PE-AL-PE is 1.56" (39.6 mm) per 100' (30m) of tube per 100° F (55° C) change in temperature. No accommodation for thermal expansion is required.

313.6.2 Clearance – Bored holes and sleeves shall provide adequate clearance between the piping and structure to allow for free longitudinal movement.

314.0 Hangers and Supports

314.1 Vertical Piping – Vertical piping shall be supported at every floor. Piping shall have a mid-story guide.

314.2 Horizontal Piping – Horizontal piping shall be supported according to the following Table A.

Table A. Support Spacing

Nominal Diameter	Spacing
1/2", 3/4", and 1"	8' 2" (2489 mm)

314.3 Hangers and Anchors – Piping shall not be anchored rigidly to a support; but shall be secured with hangers or straps that provide for a degree of movement and that prevent damage to the piping. Do not use hangers or straps with sharp or abrasive edges. Do not use hangers that pinch the piping.

314.4 Inspection and Testing

- A. Inspection – All piping shall be properly seated on to the fitting per the manufacturer instructions. Buckled, gouged or obviously damaged pipe shall not be used. Consult manufacturer recommendations for repair procedures.
- B. Testing – Upon completion of a section or of the entire hot and cold water supply system it shall be tested and proved tight under a water pressure or air test not less than the working pressure under which it is to be used. The water used for tests shall be obtained from a potable source. The system shall withstand the test without leaking for a period of not less than 15 minutes.

316.0 Joints and Connections

316.1 Joints and Connections

316.1.1 Procedure – Piping shall be cut with a pipe cutter designed specifically for composite pipe. Piping shall be cut square, i.e. perpendicular to the length. If other cutting methods are used, care shall be taken to remove any excess material, flashing, or burrs.

316.1.2 Tools – The manufacturer's recommend fitting tool shall be used with the composite insert fitting systems. For specific procedures, follow the manufacturer's recommendations.

316.2 Special Joints

316.2.1 Fittings – Transitions for composite piping to metal piping or valves shall be made only with transition fittings intended for that purpose.

606.0 Joints and Connections

606.1 Joints – Joints shall not be allowed in piping installed in or under a concrete slab resting on grade unless for repair within a building structure. All repair joints shall be properly protected with a heat shrink sleeve. All slab penetra-

tions shall be sleeved.

608.0 Water Pressure, Pressure Regulators, and Pressure Relief Valves

608.1 PEX-AL-PEX Piping – PEX-AL-PEX piping used for temperature or pressure relief valve drain lines shall be graded to the outlet end and shall be supported at a maximum of 8' 2" (2489 mm) interval horizontally. Vertical piping shall be supported at every floor. Vertical piping shall have a mid-story guide.

609.0 Installation, Unions, and Location

609.1 Bends – Piping shall be installed by bending the composite pipe by hand to a minimum radius of five times the nominal pipe diameter. External bend supports or sleeves are not required as the composite piping is rigid after bending.

609.2 Damage – Kinked, buckled, gouged, or other obviously damaged piping shall not be used.

609.3 Finish Nipples – Finish nipples shall be connected to drop ear fittings to prevent rotation. Finish nipples shall not be PEX.

609.4 Hose Bibs – The piping directly connected to any hose bib shall be so anchored that the load on the hose bib will not strain the composite piping.

609.5 Heated Joints – An open flame shall not be applied to PEX-AL-PEX or PE-AL-PE piping when brazing, soldering, or welding joints.

609.6 Working Pressure and Temperature – Long-term working pressures for the PEX-AL-PEX shall not exceed a maximum of 115 psi (793 kPa) and the long-term working temperature shall not exceed 210° F (99° C). Long-term working pressures for the PE-AL-PE shall not exceed a maximum of 160 psi (1103.2 kPa) and the long-term working temperature shall not exceed 140° F (60° C).

609.7 Exposure to Sunlight – Only UV stabilized composite piping shall be subjected to direct sunlight after installation and shall be installed on the surface of the building. Kitec pipe contains an ultraviolet (UV) inhibitor to withstand limited exposure to UV light. Manufacturer recommends placing the unused portion of a Kitec coil back in the product's box rather than storing in the sunlight while not in use.

609.8 Water Heater Connections – PEX-AL-PEX or PE-AL-PE piping shall not be installed within the first 18" (457 mm) of piping connected to a water heater.

609.10 Water Hammer Arrestors – A composite hot water system shall withstand repeated pressure surges, well in excess of its rated pressure. The Arizona Uniform Plumbing Code requires a means of attenuating water hammer. Consequently water hammer arrestors may be advisable when solenoid valves or other quick closing devices are used in the system. In designing for these situations, it is advisable to consult the pipe or fittings manufacturer for recommended surge pressure limits. Water hammer and surge pressure calculations are reviewed in Chapter 7, AWWA Manual M-11.

610.1 Size of Potable Water Piping

610.1.1 Method – Piping shall be sized in accordance with a Arizona Uniform Plumbing Code Section 610.0. When a Arizona Uniform Plumbing Code Appendix A is applicable, use Table B.

Add equivalent lengths from Table C when determining developed length.

Maximum velocities through PEX-AL-PEX and PE-AL-PE copper alloy fittings shall be limited to 8' per second (fps) (2.4 mps) in cold water and 5' per second (fps) (1.52 mps) in hot water.

Table B. Head Loss vs. Flow Rate

Flow Rate U.S. GPM	1/2"		3/4"		1"	
	Head Loss Psi/c.ft.	Velocity Ft./s	Head Loss Psi/c.ft.	Velocity Ft./s	Head Loss Psi/c.ft.	Velocity Ft./s
0.1	0.02	0.2	0.002	0.07	0.001	0.04
0.2	0.1	0.4	0.01	0.1	0.002	0.08
0.3	0.2	0.6	0.02	0.2	0.005	0.1
0.4	0.3	0.7	0.03	0.3	0.009	0.2
0.5	0.5	0.9	0.04	0.3	0.01	0.2
0.6	0.6	1.1	0.05	0.4	0.02	0.3
0.7	0.9	1.3	0.07	0.5	0.02	0.3
0.8	1.1	1.5	0.09	0.5	0.03	0.3
0.9	1.4	1.7	0.1	0.6	0.04	0.4
1.0	1.6	1.8	0.1	0.7	0.05	0.4
2.0	5.9	3.7	0.5	1.3	0.2	0.9
3.0	12.5	5.5	1.0	2.0	0.4	1.3
4.0	21.3	7.3	1.8	2.6	0.6	1.7
5.0			2.7	3.3	0.9	2.1
6.0			3.8	4.0	1.3	2.5
7.0			5.0	4.6	1.7	3.0
8.0			6.4	5.3	2.2	3.4
9.0			8.0	5.9	2.7	3.8
10.0			9.7	6.6	3.3	4.2
11.0			11.6	7.2	3.9	4.6
12.0			13.6	7.9	4.6	5.0
13.0					5.3	5.5
14.0					6.1	5.9
15.0					6.9	6.3
16.0					7.8	6.3
17.0					8.7	6.7
18.0					9.7	7.1
19.0					10.7	7.6
20.0					11.8	8.0

Table C. Developed Length

Sizes, Inches	Type of Fittings	Equivalent Length of Pipe (Feet)
1/2	Couplings	2
	Adapters	2
	Elbows	7.5
	Tees (Branch Flow)	8
	Tees (On the Run)	2.5
3/4	Couplings	2
	Adapters	2
	Elbows	8.5
	Tees (Branch Flow)	10.5
	Tees (On the Run)	2.5
1	Couplings	2
	Adapters	2
	Elbows	9
	Tees (Branch Flow)	11
	Tees (On the Run)	2.5

Historical Note

New Section made by final rulemaking at 9 A.A.R. 1189, effective May 18, 2003 (Supp. 03-1).